B 873425

DEC 16 1960

ENGINEERING • CONSTRUCTION • OPERATIONS

PIPE LINE INDUSTRY

DECEMBER
1960

CONSTRUCTION REPORT

Pemex's Swamps-to-Mountains Gas Line 22

INGENIOUS FRENCH

Pre-Fabricate 5-Line Seine River Crossing 27

SAHARA GAS AND OIL

Two More Desert Lines Reach Med Ports 30

PACKAGED UNITS

Axial Gas Compressors Make Field Debut 35

IMPROVING ACCURACY

Mobile PD Metering Unit 'Straps' Tanks 36

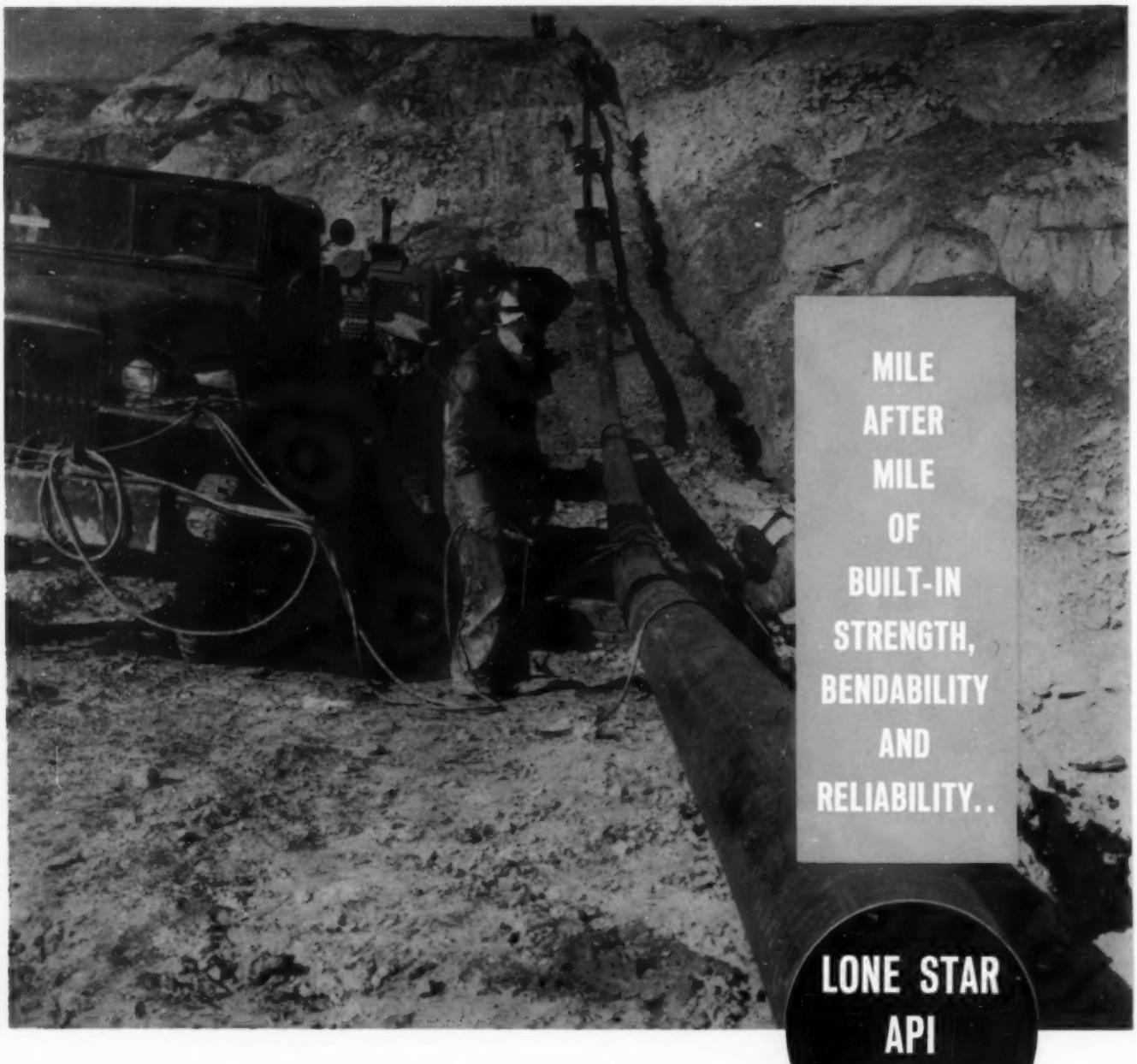
COMMUNICATIONS COST-CUTTER

Solving Microwave Problems Ahead of Time 39

THE LIBRARY OF
DEC 29 1960

SUBSCRIPTION PRICE $2 PER YEAR

SINGLE COPY PRICE 50 CENTS



from the oil and gas country's most modern pipe mill. Every length fully normalized.

Lone Star STEEL
COMPANY

EXECUTIVE—SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas
DISTRICT SALES OFFICES
912 Republic National Bank Building, Dallas, Texas
Houston, Texas | Midland, Texas | Tulsa, Oklahoma

Joe Roughneck's Pipe Mill

B 873425

PIPE LINE INDUSTRY

A GULF PUBLISHING COMPANY PUBLICATION

December 1960 Vol. 13, No. 6

CONTENTS and Quick Look

To help you put first things first, scan these time-saving digests, checking ✓ those you want to read first.

PIPELINING WORLD-WIDE

Construction of 24-Inch Gas Line from C. Pemex to Mexico City

☐ To complete this new 484-mile line, linking Mexico's isthmus gas fields with the country's central industrial area, contractors overcame swamps, mountains, rocks and 10 unpredictable rivers. Scheduled for initial deliveries early next year, it will become the backbone for an important Pemex gas network. Addition of nine compressor stations, supply and delivery laterals are already on the drawing board in expansion plans for next year.
By Ing. Francisco X. Peredo.....Page 22

French Prefabricate Five-Line Crossing of the Seine River

☐ Lines were clamped together, braced for handling and barged to the crossing site. There, they were lifted from the barges, lowered into the river and backfilled with five feet of sand and cobblestone. Some 14 tons of chain were used as extra ballast during the lowering-in.
By Anthony Gibbon.....Page 27

French Pipeliners Put Finishing Touches on Two More Sahara Lines

☐ Soon there will be two 24-inch crude lines and one 24-inch gas line bringing hydrocarbons to the Mediterranean coast. The gas line which taps the Hassi R'Mel field, estimated to have a 70 trillion cubic foot reserve, will have the greatest impact on pipelining. Because of the size of the field, over one-fourth as large as all the reserves of the United States, the gas must someway be transported to the continent of Europe. Pipelining, however, is pretty much the same in Africa as it is in the United States.....Page 30

Pipe Is Being Internally Coated at the Mill

☐ This process is being phased in with the other steps in pipe manufacture. At A. O. Smith's Milwaukee plant, a joint is first wire-brushed and scrubbed with hot cleaning solution, flushed with hot water and dried with heated air. Induction heaters raise pipe wall temperature more and it is sprayed with an epoxy coating. All operations are carried out inside the plant.....Page 34

Packaged Axial Compressors Make Debut on Shell Gathering System

☐ The units are high-speed helical-type positive displacement rotary compressors equipped with mechanical seals. Rotor case requires no lubrication because there is no metal-to-metal contact between the two rotors or between the rotors and housing.....Page 35

Mobile Metering Unit for "Strapping" Tanks

☐ This compact unit with three meters—one to serve as a standby prover meter—can provide more accurate tank tables because its calibration will compensate for tank dents, flexures, tilting etc. All equipment is in two skid-mounted packages. One, the power unit having a 147-hp gasoline engine; the second is comprised of all meters, valves and piping.....Page 36

Which Contactors for Medium Voltage Control—Oil or Air?

☐ Serviceable units of either kind are available now, you can take your pick. Each has advantages; each one is now safe.
By H. A. Wright.....Page 37

Tips That Can Improve Your Microwave System

☐ Here are some of them: Keep individual station records so trouble can be spotted and eliminated before it develops. Maintenance men should commit block diagrams and maintenance routines to memory. Instruments and test equipment should be adequate.
By Harold E. Smith.....Page 39

REGULAR MONTHLY DEPARTMENTS

Editorial Page 4
Pipe Line Panorama 21
Ideas for the Future 43
Rules of Thumb 45
Pipe Line Hints 46
Construction News 49
On the Line 56
Pipe Line Men in the News 60
Who's Meeting Where 66
Service and Supply Men 68
Classified Advertising 78
What's New in Equipment 81
New Equipment Literature 96
ADVERTISER'S INDEX 98

PIPE LINE INDUSTRY published every month. Second class postage paid at Houston, Texas. © Gulf Publishing Company 1960

A time for decision

He has no popular mandate. He barely squeaked by in electoral votes. He faces a strong coalition of Republicans and conservative Southern Democrats.

But, Senator John F. Kennedy does have the presidency. He has Lyndon Johnson who will continue to exert strong influence in Congress. He has the power of veto. And he has the Democratic platform to put into action, in addition to his many commitments to minority groups.

What does all this mean to the oil and gas industry? Considerable. Look at the President-elect's stand on some of the major issues:

Taxes. Kennedy will use his influence in Congress to make taxation a major lever of economic control. He will tighten pressure to close tax loopholes, but the domestic depletion provision has a good chance to survive. Overseas depletion may be a different matter. He is expected to urge help for business through new depreciation methods to make growth and investments more attractive. Tax-deferred pension plans for the self employed are a possibility.

Labor. He is expected to push for repeal of the Taft-Hartley clause permitting states to pass right-to-work laws. Weakening of the Taft-Hartley clause that forbids common-site picketing is likely. New efforts will be made to increase the minimum wage. Also, setting of uniform federal unemployment compensation at 66⅔ percent of a State's average weekly wage for 39 weeks, resulting in smaller employer rebate.

Federal regulation. The Interior Department and Federal Power Commission are expected to operate under a more strict policy, with generally tighter controls on business. A new natural gas bill will not be introduced without administration support. Congressmen supporting such a bill have made this clear.

National fuels policy. Kennedy pledged a comprehensive study of our nation's energy policies during his nomination campaign through West Virginia last spring. Coal's efforts to bring about end-use controls through this policy are continuing full pace. However, it will be at least a year before any action is taken one way or the other.

Imports. The new Administration will take early action on the entire U.S. import program, including a new means of allocating residual imports. There is a good chance for support of further crude oil import curbs.

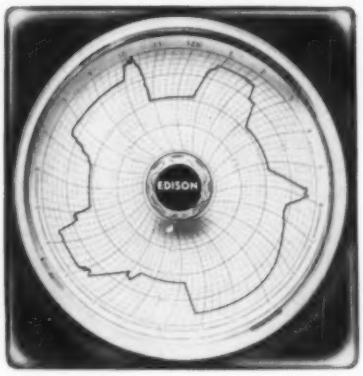
Higher taxes. Although many of the above appraisals look favorable for the oil and gas industry, Kennedy can be expected to exert considerable effort to put his multi-billion-dollar social welfare, military spending and federal aid programs through Congress. Thus, the next four years point toward higher taxes and tighter federal control of business—both of which are negative factors in the expansion of the U.S. business economy. That is, unless strong measures are taken to ease the burden elsewhere.

That is where industry comes in. It cannot sit back in sublime complacency and let the trend continue toward tighter federal control of our economy. An all-out effort must be made to give the public an economics lesson it can understand. And this is not a one-industry job.

Oil, steel, automobile and every other industry that does not want to sacrifice its economic freedom for federal subsidy should join in one united effort. Labor unions, social welfare proponents, and those wanting more and more federal handouts unite with considerable success, why can't industry?

Now is the time for decision. Not tomorrow.

EDISON'S OMNICORDER
NEW MINIATURE INKLESS RECORDER

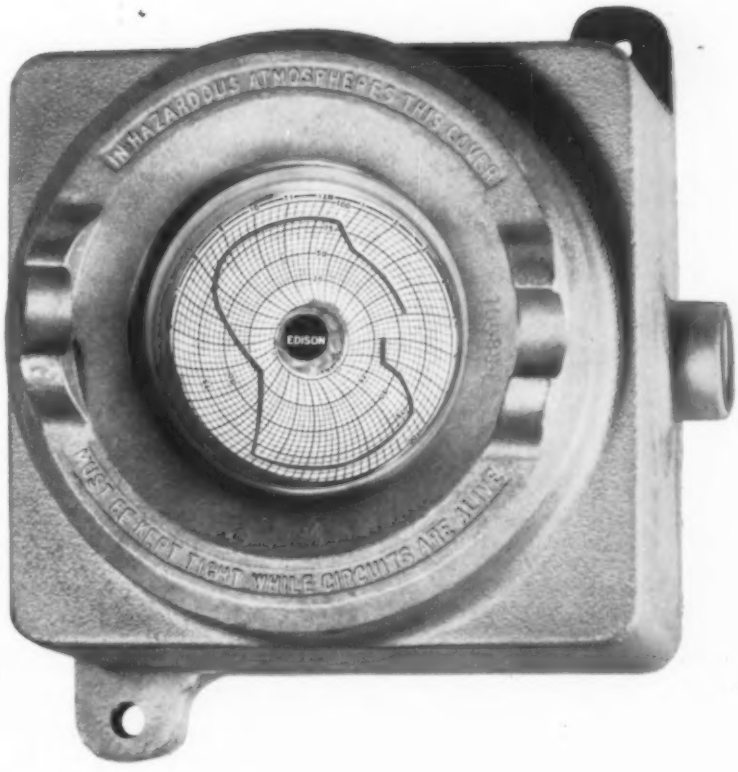


DESIGNED FOR STANDARD, INEXPENSIVE EXPLOSION-PROOF ENCLOSURES

- JUST 3¾" X 3¾" X 3"
- NO PEN, INK OR RIBBON
- CHARTS EASY TO CHANGE
- BUILT-IN VARIABLE CHART SPEED
- RECORDS ANY VARIABLE
- ECONOMICAL

Edison's Omnicorder will record any variable that can be converted to an electrical signal—from thermocouple outputs to flow measurements and power consumption. In addition to its low initial cost, further savings are inherent in Omnicorder because it fits into a standard Crouse-Hinds type GUB110-1-02 instrument enclosure and meets all explosion-proof requirements. Now you can install and operate this precise circular chart recorder at a cost considerably lower than conventional recorders.

The remarkably legible 3-inch chart requires no pen, ink, ribbon or other cumbersome mechanisms. A simple three-speed adjustment regulates chart rotation to provide a variety of time sequences: one hour, one day and seven days per revolution—or one day, seven days and thirty days per revolution. Standard, easily-changed charts are available for electrical measurement, temperature, pressure, flow, and special charts can be designed to fit specific requirements. Omnicorder is operative in temperature ranges from minus 20°F to plus 175°F. For complete information on this rugged, maintenance-free Omnicorder, write for Catalog 3057.



Thomas A. Edison Industries
INSTRUMENT DIVISION
95 LAKESIDE AVENUE, WEST ORANGE, N. J.

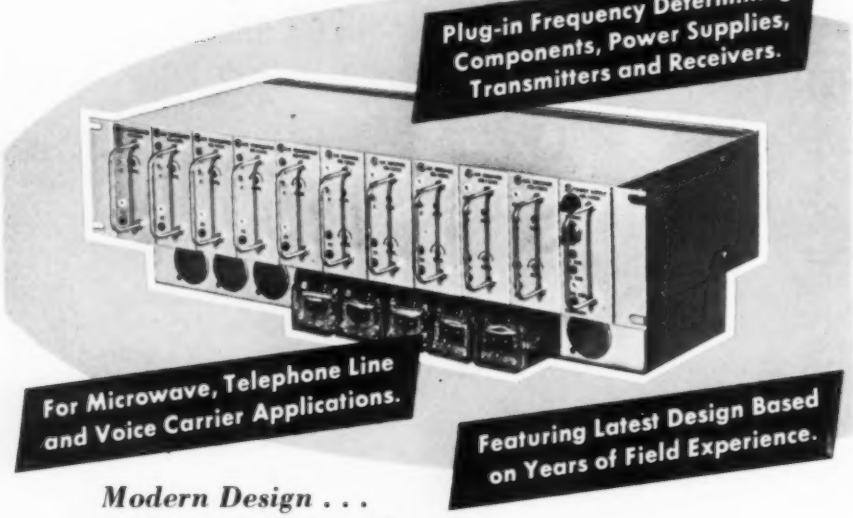
McGRAW EDISON

REMOTE INSTRUMENTATION & CONTROL

Newest RFL Transistorized Series 2056

AM and FS Tones

for TELEMETERING and CONTROL APPLICATIONS


Plug-in Frequency Determining Components, Power Supplies, Transmitters and Receivers.
For Microwave, Telephone Line and Voice Carrier Applications.
Featuring Latest Design Based on Years of Field Experience.

Modern Design . . .
10 Transmitters or Receivers
and Power Supply in One Single Frame.

The 2056 Series of Audio tones features modern design utilizing plug-in card construction and provides equipment at a very minimum in cost with a maximum number of channels in a given space. For example, 10 AM transmitters or receivers and a common power supply are mounted in a single 3½ x 19" frame. Each channel is conveniently terminated with a terminal strip at the rear of the frame. Output relays are mounted on a bracket attached underneath the main chassis frame, each relay being located directly under its respective channel.

The channel frequency determining components are also of the plug-in type and are mounted directly on the channel plug-in assembly in AM units, and adjacent to plug-in assemblies on FS units. This type of design, of course, keeps spare parts requirements to a minimum, since all plug-in cards are common to all frequencies.

The 2056 Series of AM tones were designed to meet low speed tone signalling and control requirements when low noise lines and inherently low noise communication circuits as provided by microwave and voice carrier equipments are available for transmission.

The 2056 Series of FS tones are used when ultimate reliability and high speed keying is required. They can be used in circuits which are inherently noisy and which are subject to fading conditions.

The FS tones are available with either TWO or THREE frequency outputs. The former being employed in normal signalling and control circuits, whereas the latter is used in two-function single channel applications such as RAISE-OFF-LOWER, FORWARD-OFF-REVERSE.

RFL REPRESENTATIVES:

ILL., MINN., IOWA, IND., WISC.
W. L. Cunningham, Elmhurst, Ill.

TEXAS, ARK., LA., OKLA.
Datatrol Co., Dallas, Texas

ALA., TENN., VA., N.C., S.C., GA.
Dickerson Eng., Jacksonville, Fla.

CALIFORNIA
Luscombe Engr., Pasadena, Calif.

ORE., WASH.
Hawthorne Electronics, Seattle, Wash.

CANADA
Microwave Sys., Scarborough, Ont.

FOREIGN
Telesco International, New York

SEND FOR TECH. DATA — For additional information, including application data, write or phone DE 4-3100. Demonstrations available by local representatives.

RFL Radio Frequency LABORATORIES, INC. Boonton, New Jersey, U.S.A.

PIPE LINE INDUSTRY

RAY L. DUDLEY, Founder, 1891-1957

WILLIAM G. DUDLEY.....Publisher
MELVIN A. JUDAH.....Editor
DONALD G. DEPUGH.....Construction Editor
WALLACE FITZGERALD.....Managing Editor
DONALD M. TAYLOR.....Engineering Editor
DON E. LAMBERT.....Associate Editor
ANTHONY GIBBON.....Mid-Continent Editor
CHARLES VERVALIN.....Associate Editor
JACK COCKERHAM.....Presentation Editor
JOHN BRADLEY.....Editorial Assistant
GARY DUNHAM.....Editorial Assistant
DOLORES REYNOLDS.....Editorial Assistant
EUNICE M. OKONESKI.....Librarian

Published by
GULF PUBLISHING COMPANY

EXECUTIVE OFFICES: 3301 BUFFALO DRIVE, HOUSTON
Cable Address, Gulfpubco, Houston
World's Largest Specialized Publishers to the Oil Industries

WILLIAM G. DUDLEY.....President
TOM W. NELSON.....Vice Pres.-Gen. Mgr.
R. M. DE SOMBRE..Vice Pres.-Asst. Gen. Mgr.
NELSON L. BIGELOW....Vice President, Sales
MRS. RAY L. DUDLEY.....Vice President
P. J. AUCOIN.....Treasurer

ADVERTISING

HOUSTON (1): PO Box 2608, Nelson L. Bigelow, Advertising Sales Manager, Charles Wyatt, C. A. Davis, Cecil W. Smith, Phone JAckson 9-4301

SUMMIT, NEW JERSEY: 382 Springfield Avenue, Sam Sorrell, Phone CRestview 7-1221.

CLEVELAND (16): 20800 Center Ridge Road, Bill Westfall, Phone EDison 3-1650

CHICAGO (46): 6039 N. Cicero Avenue, Don V. Howard, Phone AVenue 2-4333

LOS ANGELES: 1810 Fair Oaks Ave., South Pasadena, Calif., Jay Curts, Jim Merrill, Phone MUrray 2-3518

TULSA (3): 916 Enterprise Building, Jim Isaacks, Phone LUther 2-9211

DALLAS (8): 1808 Sylvan Drive, Ed Thompson, Phone RIverside 7-7344

KÖLN-BRAUNSFELD, GERMANY—Aachener Strasse 378, Gerd Hinske, Phone 52 22 60

LONDON, ENGLAND: 120 Moorgate, E. C. 2, Frank Chambers, Agent, Phone MOnarch 5661.

Advertising rates on application.

SUBSCRIPTIONS

R. B. Reilly, Circulation Manager, P O Box 2608, Houston 1, Texas, U.S.A. Single copies 50 cents. Double price for single copies more than a year old. Subscription rates: both foreign and domestic $2 a year, $3 for 2 years, $4 for 3 years. Copyright 1960 by Gulf Publishing Company.

Postmaster: Send notification (Form 3579) regarding undeliverable magazines to PIPE LINE INDUSTRY, Box 2608, Houston 1, Texas.

GPC PUBLICATIONS

PIPE LINE INDUSTRY and The PIPE LINE CATALOG for the oil and gas pipe line industry.

WORLD OIL (formerly the Oil Weekly) and The COMPOSITE CATALOG for the drilling-producing industry.

PETROLEUM REFINER and The REFINERY CATALOG for the Hydrocarbon Processing Industry.

Indexed by Engineering Index

Copyright, 1960, by The Gulf Publishing Company.

AND NO SWEAT

Absolutely "no sweat" when every weld has been examined on Ansco Industrial X-ray film!

Experienced pipeliners like the uniformity and dependability of Ansco films under every condition. They depend on Ansco for easy readability and revealing gradation that clearly detects even the most elusive flaws.

If you have never used Ansco Industrial X-ray materials in your work, contact your local Ansco representative. He will show you how to set up a "no sweat" operation with Ansco. Ansco, Binghamton, N.Y., A Division of General Aniline & Film Corporation.

Ansco

Industrial X-ray

Economy never came in such a choice!

NEW FORD TRUCKS FOR 1961

619 NEW MODELS! All engineered with one idea in mind . . . economy! New "Big Six" engine for 2-tonners plus five Cummins diesels for the new H-Series tractors expand the proven line of Ford engines to 18—with one just right for your job. A wider-than-ever choice of transmissions and axles. And . . . on all 1961 Ford Trucks, each part, except tires and tubes, is now warranted by your dealer against defects in material and workmanship for 12 months or 12,000 miles, whichever occurs first. The warranty does not apply, of course, to normal maintenance service or to the replacement in normal maintenance of parts such as filters, spark plugs and ignition points.

FORD TRUCKS COST LESS

YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" PROVES IT FOR SURE!

New! Durable Tandems

Ford's Tandem Axle trucks for '61 are engineered to give you greater flexibility and significant payload advancements. Your choice of 22,000-lb., 28,000-lb., 30,000-lb., 34,000-lb., or 38,000-lb. axle capacity. New, longer wheelbases are available to permit installation of special bodies up to 21 feet long. Aluminum walking beams as well as aluminum wheels and gas tanks are optional for reduced chassis weights.

FORD DIVISION, Ford Motor Company

For more data on advertised products, use Readers' Service Cards, last page.

New!
Space-Saving Tilts

Ford's popular Tilt Cab Series outsells all the other makes and for good reason! Compact 82-inch BBC permits longer bodies for a given over-all length, and wide-track front axle makes it more maneuverable for congested area work. Ford offers the lowest-priced* tilt-cab model in the industry! And for '61, the bigger Ford Tilts are available with a lightweight, fiberglass sleeper cab compartment that adds only 2½ inches to the standard BBC dimension.

**Based on a comparison of latest available manufacturers' suggested retail delivered prices*

New! H-Series Diesel- or Gas-Powered Tractors

Ford's new H-Series tractors with 28-inch front axle setting and 82-inch BBC are offered in four single-axle and four tandem-axle models with over 500 engine-axle-transmission combinations. Choose from ten industry-accepted engines—five Cummins diesels and five Ford Super Duty V-8's!

New 100,000-mile warranty on Super Duty V-8 gas engines is most liberal in the industry. On 401-, 477- and 534-cu. in. V-8's, Ford Dealers will replace any major engine part (including block, heads, crankshaft, bearings, valves, pistons, rings) found to be defective in materials and workmanship in normal on-highway use. Warranty covers full cost of replacement parts for 100,000 miles or 24 months, whichever occurs first . . . full labor costs for first year or 50,000 miles, sliding percentage scale thereafter.

HEAVY TRUCK GENUINE PARTS Ford SERVICE DIESEL CUMMINS

NATIONWIDE SERVICE . . . *look for this sign at Ford Dealers' across the country, for service on all Ford gas and diesel trucks!*

New! "Big Six" Engine

More power for America's savingest 2-tonners . . . a big 262-cu. in. Six with the performance of big displacement, the durability of heavy-duty construction, plus the gas economy of 6-cylinder design! Available early 1961. You also get improved riding comfort with new smoother-acting springs and a sturdy truck suspension system that can give up to twice the front tire life of some other makes.

New! 4-Wheel Drive Pickups

Ford offers the lowest-priced* 4 x 4 with big 8-ft. box. And these models have the getup and traction to go most anywhere . . . road or no road! You can choose from two modern engines—the gas-saving 135-hp Six or the 160-hp V-8 that gives extra power and smoothness with "six-like" economy.

B&W WELDING FITTINGS

MADE BY MEN WHO KNOW METALLURGY

B&W Welding Fittings manufacturing is integrated with the Division's facilities for research, development, product quality control and testing, as well as those for steel and tube-making. Take the relation between metallurgy and the manufacture of fittings. B&W not only knows fittings manufacturing, but is able to control, completely, all phases of the manufacturing process . . . starting with the melting of the steel. Integration plus metallurgical knowledge and practice makes for superior fittings. It enables B&W to provide a quality-controlled product, matched to end use service.

B&W Welding Fittings and Flanges are available through qualified welding fittings distributors in carbon steel and the B&W CROLOYS in a complete range of types and sizes. Write for B&W Bulletin FB-502. The Babcock & Wilcox Company, Tubular Products Division, Fittings Plant, P.O. Box 230, Beaver Falls, Pennsylvania.

B&W THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

TA9080WF3

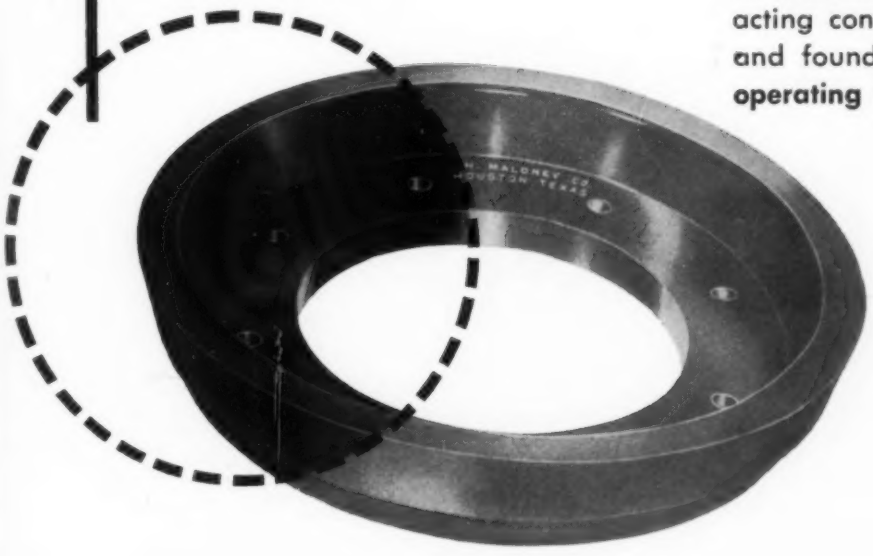
Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

TOUGH...

WHERE IT COUNTS!

More weight **where it belongs** — on the wearing area. Deeper lip with an L-profile providing controlled flexibility allowing full efficiency for the full depth of the lip. Uniform wear in all kinds of pipe under **all** conditions. Maloney scraper cups **really** get tough . . . for **extra** strength and **longer** life in any pipeline service.

Tireless research—proven design—exacting consistent manufacture—tried and found true **where it counts:** in **operating** pipelines.



Maloney scraper cups and discs are available for immediate shipment in all sizes upon receipt of order.

SCRAPER CUPS AND DISCS

. . . THE STANDARD OF THE INDUSTRY

"Something From The Irishman"

F. H. Maloney COMPANY

OFFICES IN
CHICAGO • LOS ANGELES
PITTSBURGH • TULSA

2301 TEXAS AVENUE
P. O. BOX 1777
HOUSTON 1, TEXAS

"PRECISION IN RUBBER • METALS • PLASTICS"

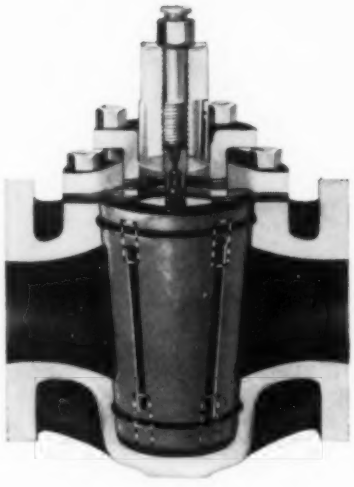
For more data on advertised products, use Readers' Service Cards, last page.

the idea:

Force Can Be Multiplied Through Hydraulics

Blaise Pascal in 1625 demonstrated that a given force can be multiplied almost infinitely through use of hydraulics. His principle: "a unit pressure applied to the liquid contained in a sealed vessel is transmitted to every part of the liquid with undiminished force, thus multiplying the force many times . . ."

the application:



How It Helps Give You A Better Valve

In the Rockwell-Nordstrom valve (the *original* lubricated plug type), lubricant is injected under pressure creating powerful instantly replaceable seals against leakage in the Sealdport® grooves between plug and body. Lubricant also hydraulically jacks and balances the plug to maintain perfect seating, instant operation.

the benefits:

Positive Shut-Off . . . Instant 1/4-Turn Operation . . . Unexposed Seating, Longer Life, Lower Cost

For a full range of services, Rockwell-Nordstrom lubricated plug valves insure the trouble-free operation and freedom from wear and repair that you can only expect from a *lubricated* mechanism. See your supplier or write for complete details on Rockwell-Nordstrom lubricated plug valves, lubricants and operating accessories. Or better yet, have a Rockwell field engineer visit you. Rockwell Manufacturing Company, Dept 99-M, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited. If you live outside the U. S. or Canada, write: Rockwell International S.A., Geneva, Switzerland.

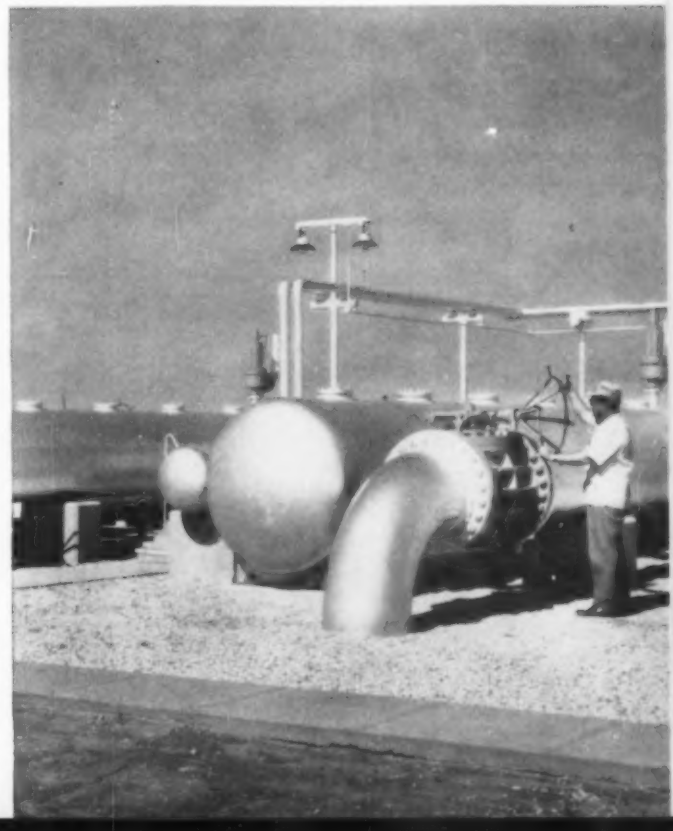
Lubrication Makes The Difference

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

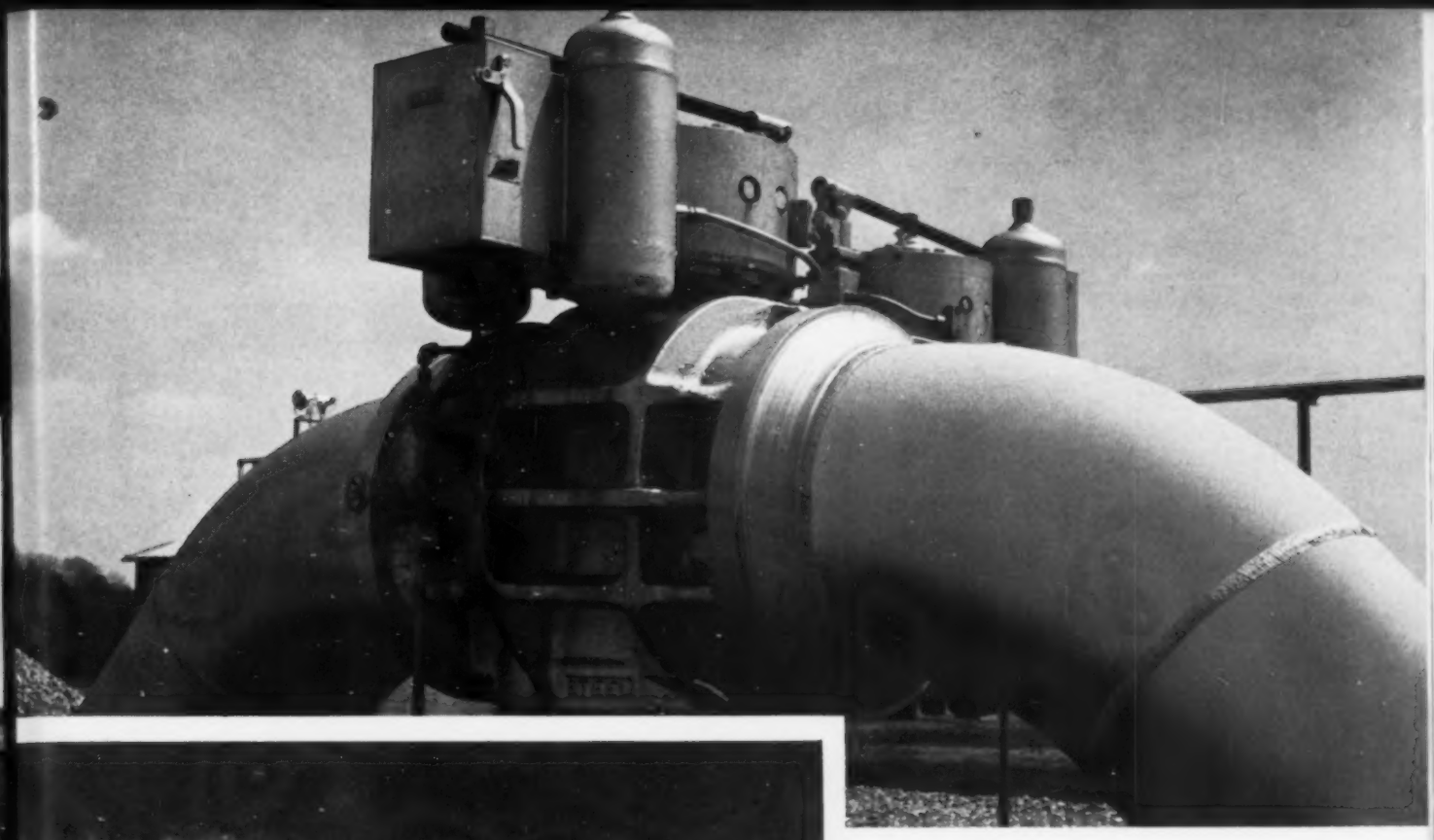
Rockwell-Nordstrom pipeline valves close 2 to 5 times faster than non-lubricated valves. Powerful positive seals of pressurized lubricant assure leak proof operation.

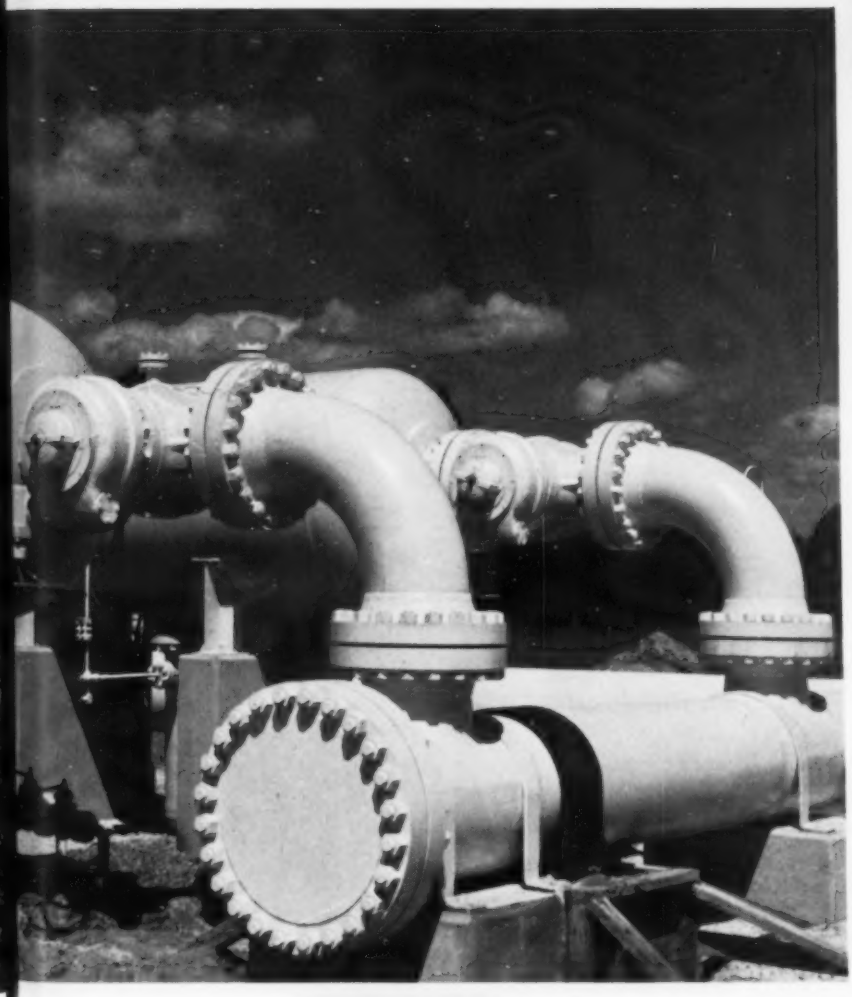


If it's sold by J&L....it's the best available. For this reason pipeliners depend on....

J&L For Better Pipelines!

This is J&L line pipe, ductile, uniformly round, and easy to weld. It is available in 60 foot lengths. J&L quality control during manufacture includes ultrasonic inspections, hydrostatic tests, visual examinations, crush tests of samples from every length and magnaflux examination of both ends of every joint. J&L line pipe has earned its position of prestige with pipeliners.





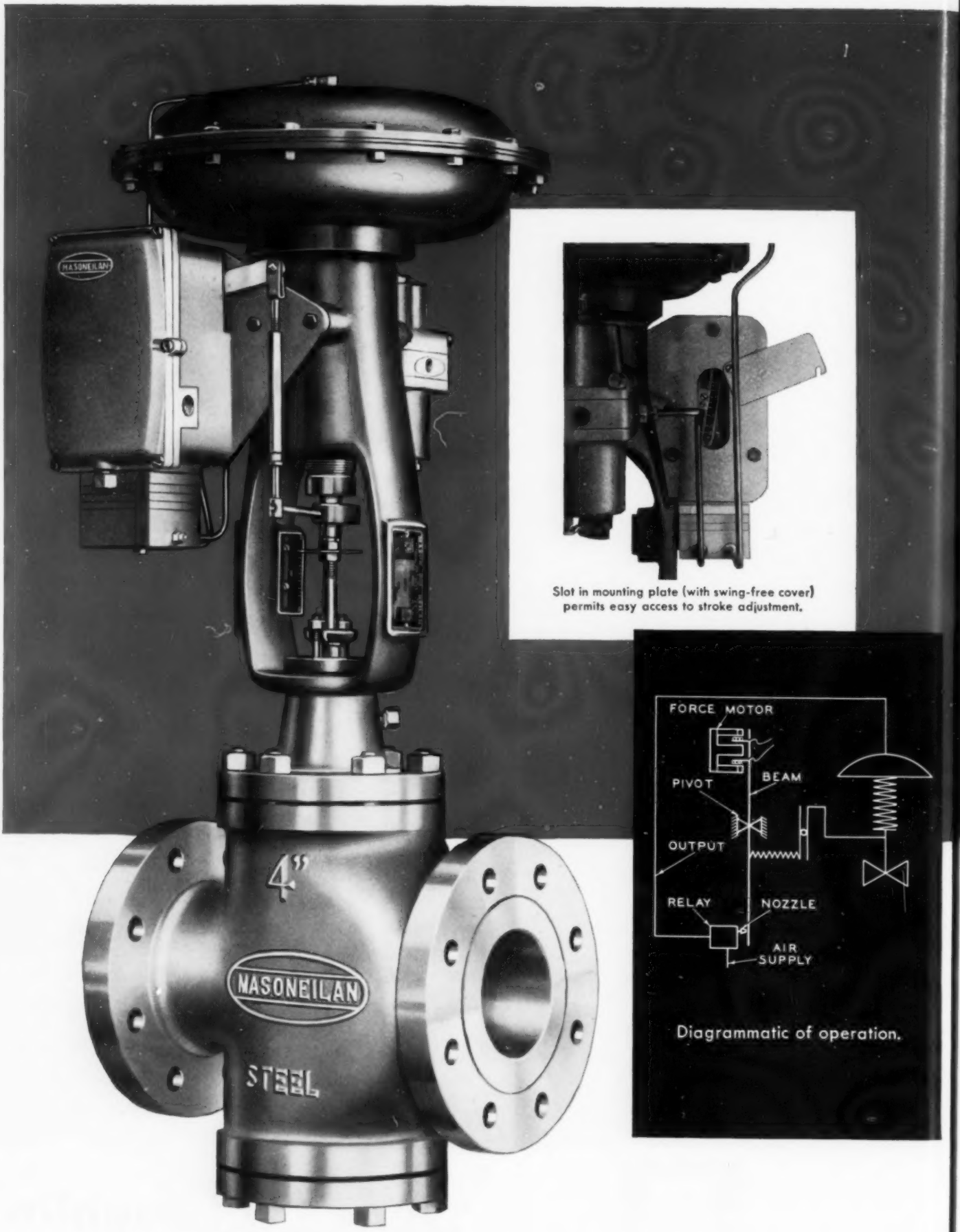
Men who plan and lay pipelines with J&L line pipe also prefer famous names in valves and fittings. Rockwell-Nordstrom, OIC, W-K-M, Stockham, Taylor Forge . . . all products in the "best available" class. Taylor Forge WeldElls and flanges and Rockwell-Nordstrom lubricated plug valves are featured "on location" here.

For technical information on line pipe, valves and fittings, ask your local J&L Supply man or write us at Tulsa—Drawer 2481. J&L electricweld line pipe is available in sizes from 6⅝" through 12¾" O.D.; J&L seamless line pipe from 2⅜" through 14" O.D.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

115

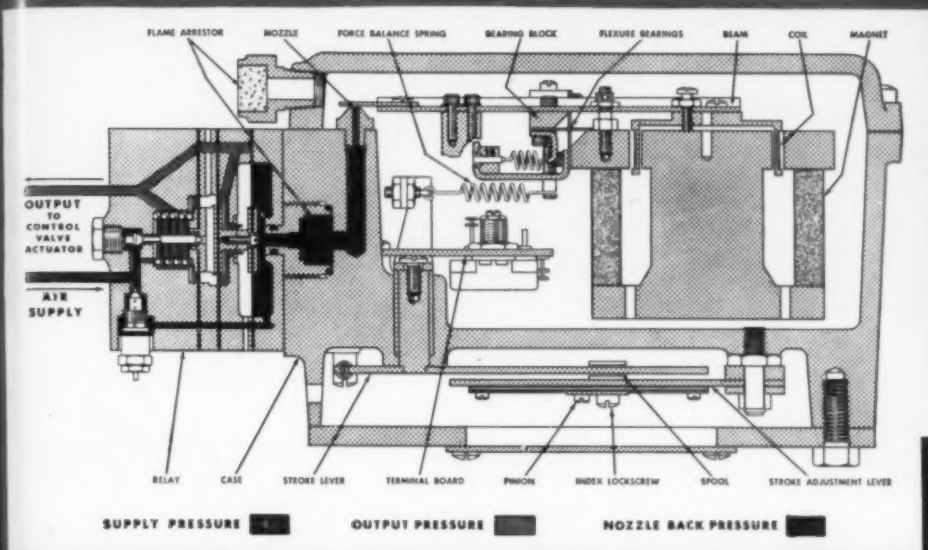


Model 8010 mounted on spring-diaphragm actuator. Note compact design.

Slot in mounting plate (with swing-free cover) permits easy access to stroke adjustment.

Diagrammatic of operation.

Schematic of air circuits.



Speed The speed of the positioner, with integral relay and normal 20 psi supply pressure, is tabulated below.

ACTUATOR SIZE	VALVE STROKE (inches)	SPEED (seconds)
9	½	1.5
	¾	1.8
11	¾	2.8
	1	3.3
13	1	4.9
	1½	6.3
15	1½	9.4
	2	11.4
18	2½	21
	3½	29
	4	32

Performance Data

Open-loop Gain* — approximately 100
Linearity — within ±1% of full stroke
Repeatability — within 0.2%
Load Sensitivity — Output pressure change of 1.2 psi per 0.1% of full stroke offset
Supply Pressure Effect — ±1% of full stroke for ±5 psi change from 20 psi

Defined as $\frac{\%\text{ of air output}}{\%\text{ of full input range}}$

Now! Masoneilan Electropneumatic Positioner with Velocity Feedback

Combines high open-loop gain and closed-loop stability to give you Precise Positioning and Superior Dynamic Response

The new Masoneilan Model 8010 Electropneumatic Positioner offers optimum performance plus these design advantages:

- A true positioner — *direct* comparison of valve stem position with controller output signal provides dynamic response and positioning accuracy not obtainable with transducer and pneumatic positioner combination.
- Electrical circuit easily adapted to a variety of controller output signals.
- Extra large stabilized magnet, plus efficient magnetic circuit, provides high force changes.
- Explosion-proof construction meets requirements of Class I, Division I, Group D.
- External stroke adjustment accessible without removal of cover — no exposure of electric wiring.
- High capacity relay for fast stroking speeds. Relay may be mounted in any one of four positions to facilitate piping.
- Balanced beam permits installation of valve in any position without shift in calibration.
- Available for 3-15 psi or 6-30 psi valve spring ranges and for split-ranging. Standard stroke ranges $\frac{3}{8}$"-3" and 2"-4". Others available.
- Available with direct or reverse action and for direct or reverse actuators.

You can now utilize the desirable characteristics of electronic control and obtain the power and smooth throttling action of pneumatic valves by using Masoneilan Electropneumatic Positioners. Full details on request. Ask a Mason-Neilan representative or write direct —

MASONEILAN

MASON-NEILAN

Division of Worthington Corporation

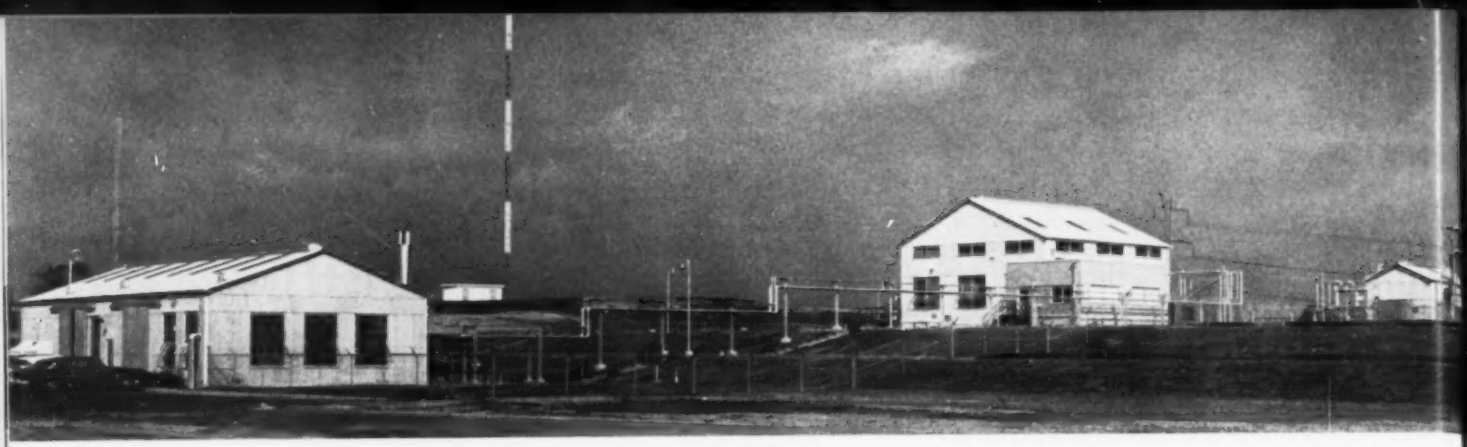
61 NAHATAN STREET, NORWOOD, MASS., U. S. A.

Sales Offices or Distributors in Principal Cities in United States and Abroad

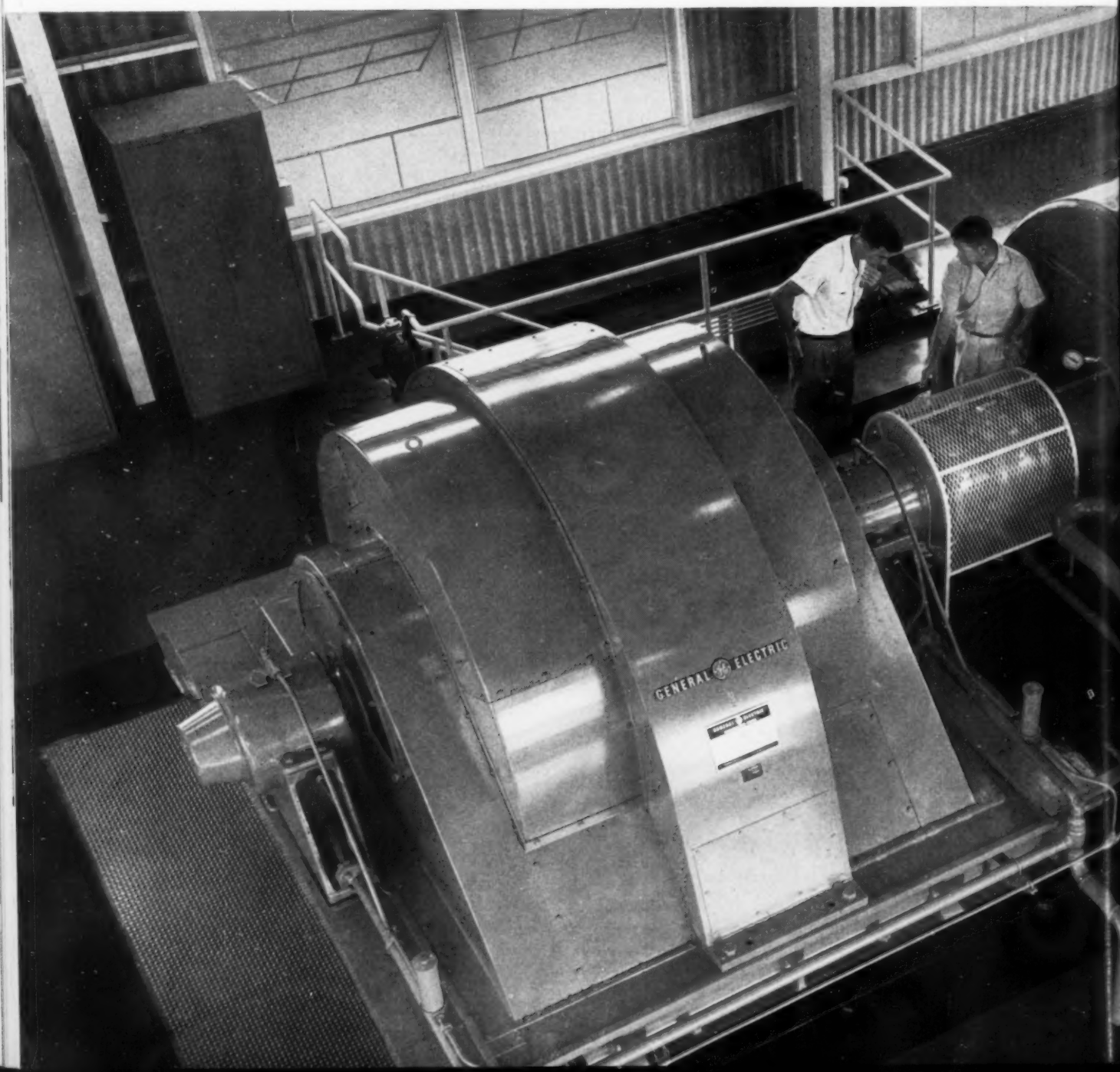
In Canada: Worthington (Canada) Ltd., Mason-Neilan Division

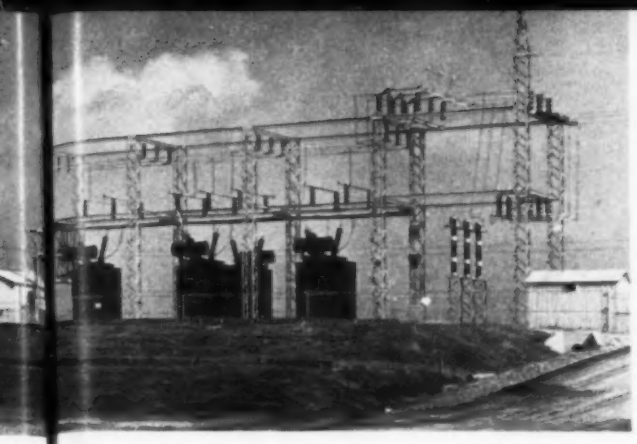
MNO-19

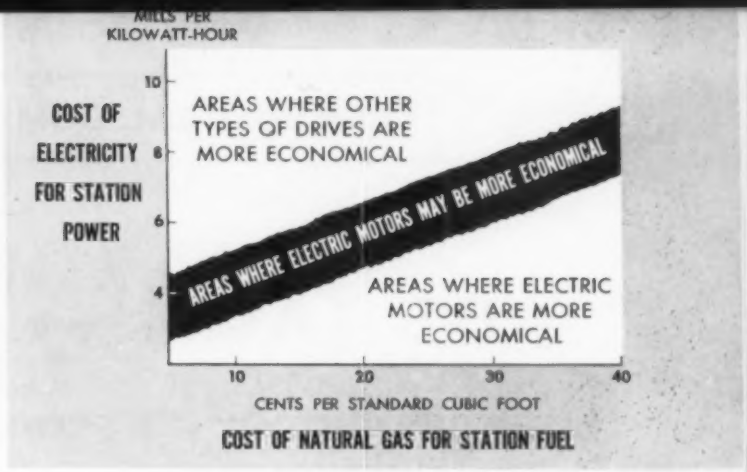
For more data on advertised products, use Readers' Service Cards, last page.



Before you select a pipeline







e compressor drive...

CHECK LOCAL POWER COSTS

WITH LOW-COST ELECTRICITY, GENERAL ELECTRIC SYNCHRONOUS MOTORS ARE YOUR BEST BUY

G-E 12,500-HP SYNCHRONOUS MOTOR and 900/4823 rpm gear driving compressor at new installation in North Carolina. This compressor station boosts typical summer volume of over one billion cubic feet of gas daily.

As the demand for natural gas increases, the use of electric power for driving pipeline compressors becomes more attractive. With low-cost electricity—readily available to pipeline companies in an increasing number of areas—General Electric high-speed synchronous motors give you these important advantages:

MAXIMUM RELIABILITY is inherent in the uncomplicated General Electric synchronous motor. Few moving parts, simple lubrication, and a pressurized air cooling system give you dependable, low-maintenance operation, day after day.

LOW INSTALLED COST is characteristic of compact General Electric motor drives. Initial cost of the G-E synchronous motor is significantly under that of other types of prime movers. And its installation—requiring much less space and foundation for its small size and weight—is simpler, faster, and less costly.

AUTOMATIC CONTROL of the compressor station is enhanced by the simplicity and ease of control of the G-E electric-motor drive. In addition, General Electric can co-ordinate the motor, gear, station control, and remote supervisory control for a completely integrated system which can be operated from miles away.

For information on how General Electric can help you analyze the economics of fuel/power costs in the locality of your next compressor station, call your General Electric Apparatus Sales Office or write to Section 661-01, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

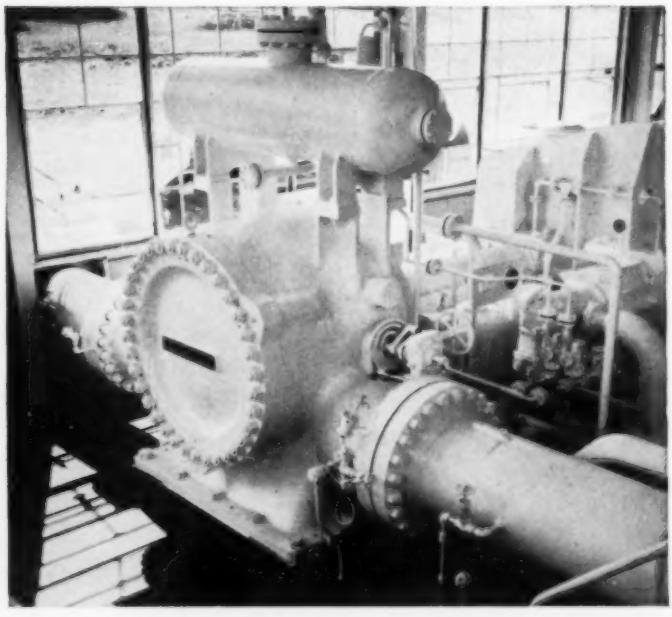
CENTRIFUGAL COMPRESSORS

DE LAVAL welded impeller permits higher horsepower, higher tip speeds, greater design flexibility

Now, with a single welded wheel, compressors rated up to 20,000 horsepower at 6500 rpm are giving excellent service.

Produced by a special welding process developed by De Laval, this new welded wheel construction permits higher tip speeds and fewer stages for a given pressure ratio.

Write for more information on this new welded impeller or contact your local De Laval representative.



Rated at 15,000 horsepower, this compressor, on stream for a prominent pipeline company, is capable of developing a pressure ratio of 1.56 in a single impeller, pumping 800 MMSCFD at an inlet pressure of 652 psia and an outlet pressure of 1020 psia.

DE LAVAL STEAM TURBINE COMPANY
884 NOTTINGHAM WAY, TRENTON 2, N. J.

BL-480 B

PIPE LINE PANORAMA

Jet Engine Moves 600 MMcf Gas Per day . . . Columbia Gulf Transmission has marked up another "first" in pipe line industry progress. CGT's main line station near Clementsville, Ky., is now pumping up to 600 MMcf gas per day using a 10,500 horsepower Pratt and Whitney J-57 jet aircraft engine to drive two-stage gas compressor. **Features include:** (1) Jet engine is adapted to run on natural gas, will soon be available in ratings from 350-15,000 horsepower. (2) It is nearly 85 tons lighter than conventional gas turbines; costs less to install, should cost less to maintain and operate. (3) Engine section weighs only 2 tons, has 10:1 compression ratio, requires no regenerating system—yet thermal efficiency equals or exceeds convention turbines with same horsepower. (4) Since engine requires less than half the space used by regenerated gas turbines, size and cost of station building are greatly reduced.

Automation-Transportation Progress Reported at API . . . Committee on automation and instrumentation reported to annual API session in Chicago that more than 500,000 horsepower is now remotely controlled in U.S. crude oil and products pipe lines—more than twice the 244,000 horsepower reported two years ago. One out of 3 products stations and 1 out of 4 crude oil stations are now remotely controlled. However, only 1 out of 110 crude gathering stations is automated.

Standard Oil's R. K. Paine reported that pipe lines now handle 75 percent of crude oil deliveries to U.S. refineries, and 20 percent of products transportation. Among other advancements, he foresees that in next decade more pipe lines will serve service stations directly, greatly reducing volume of products trucked from terminals.

Sun Oil's E. H. Wilder calls for new techniques and equipment, and close watch on federal regulation, to alleviate problems created by growing pipe line communications needs. He reports pipe lines now own 1,200 microwave stations covering 27,000 path miles, plus thousands of miles of leased and privately owned wire lines.

First Major Line to be Completely Double Jointed . . . Pacific Gas and Electric's 1,250-mile, 30-36-inch gas line from Alberta, Can., to California will be completely double jointed, using submerged arc welding units. This is the first time these new methods will be used on an entire major project. Two 40-foot joints will be welded into 80-foot joints. Advantages: Better weld—half of welding will be completed before pipe is shipped to right-of-way.

Pipe Line Briefs . . . In first major protest against new area gas pricing policy, Phillips Petroleum has requested FPC to erase price ceiling differences between new (16 cents) and old (11 cents) Permian Basin gas . . . **IPAA President Alvin Hope** reports an industry-wide task force is "very, very close to agreeing on a new natural gas bill; however, little hope is expected for passage without Administration support . . . **Plans to build more than 4,200 miles of crude, gas, condensate and products lines on three continents are moving ahead,** i.e., **South America:** Bids have been opened on 1,050-mile, $380 million line to provide Buenos Aires with gas from Comodoro Rivadavia—biggest gas line to be built outside the U.S. **Europe:** Russia has announced $200 million barter agreement with Italy's Finsider and ENI to provide equipment for 2,800-mile crude line from Second Baku to East Europe; ENI will provide pumping equipment and synthetic rubber and Finsider 240,000 tons of pipe—in return, Italy will receive 60,000 barrels of crude oil per day. **Africa:** Pipe has been ordered and contracts will be let soon on 8-inch, 190-mile French Sahara condensate line from Hassi R'mel gas field to Hassi Messaoud-Bougie crude line; completion date: April 1961. Also, products line from Beira, Mozambique to Rhodesia border has been given green light from Portuguese government; cost: $16.8 million.

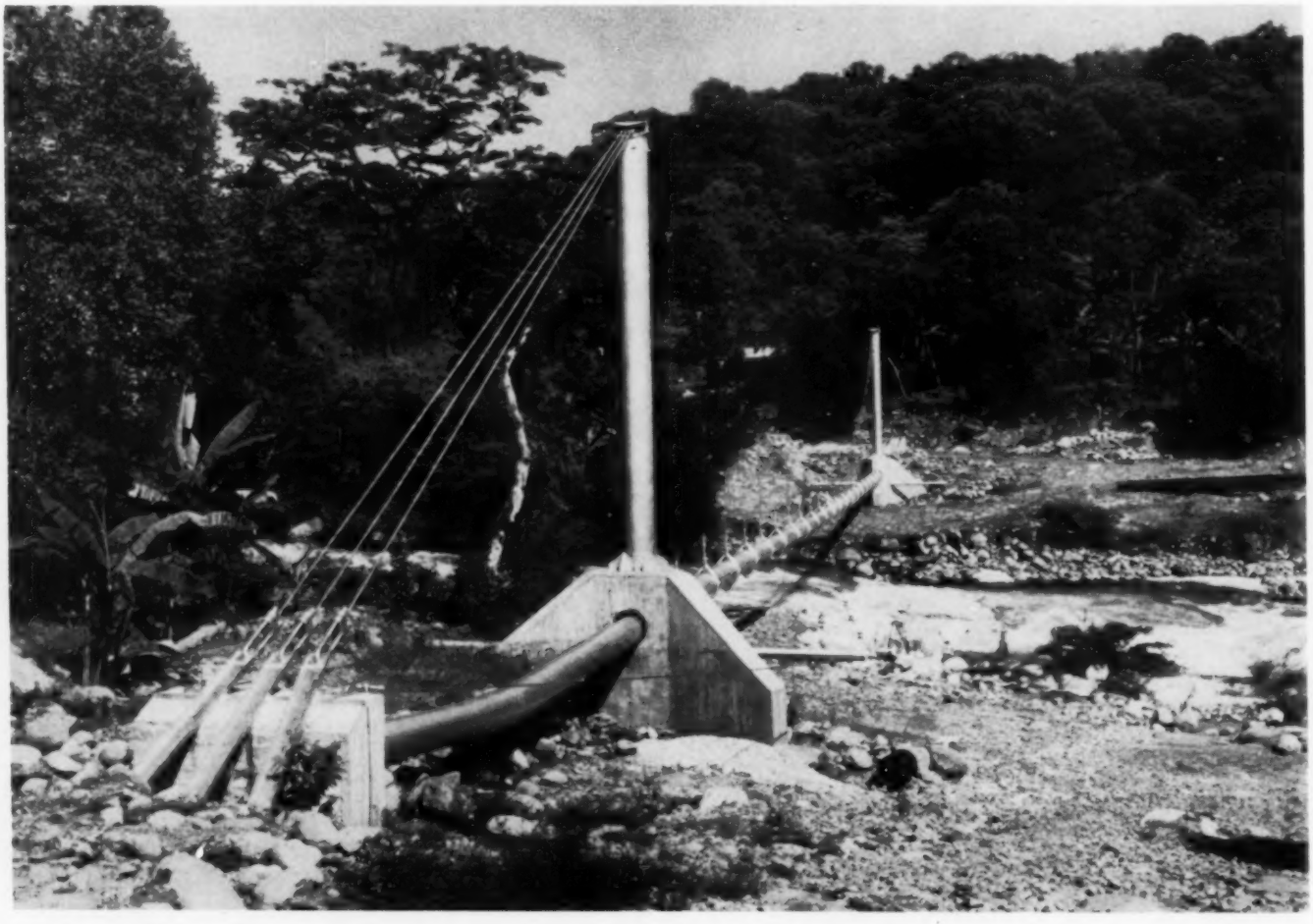
Construction of 24-Inch Gas Line From C. Pemex to Mexico City

New 484-mile line crosses swamps, deep lagoons, rock and mountains plus populated areas to bring Pemex gas to major industrial areas in Central Mexico

By Ing. Francisco X. Peredo
Superintendent of
Construction, Petroleos
Mexicanos, Mexico City

CONTRACTORS ARE NOW PUSHING to completion the 484-mile, 24-inch pipe line that Petroleos Mexicanos is constructing to serve the important industrial zone near Mexico City. Pemex's new line will utilize large reserves in the José Colomo field in the State of Tabasco to further development of Mexico's principal interior cities. Construction of the line began in May 1959. Present schedules call for the main line to be completed by the end of this year; for the entire project to be in commercial operation by March 1961.

The main line consists principally of 24-inch outside diameter, API-5LX Grade X-52, cold expanded, 0.344-inch wall pipe, factory welded by the submerged arc process. Pipe of 0.438-inch wall thickness is used near populated areas and 0.625-inch wall pipe



Pemex engineers made use of variety of river crossing techniques. Suspension bridge spans stable banks of rocky Rio Blanco.

was used for the underwater river crossings. The 128,000 U.S. short tons (115,000 metric tons) of pipe necessary for this line was fabricated in Monterrey by Tubacero; steel plate was furnished by Altos Hornos de México, S.A. in Monclova.

Operation Plans. This line will operate initially at a maximum pressure of 1,075 psi; without compressor stations it has a capacity of 220 MMCF per day. In the second stage of operation, the C. Pemex-Mexico City line will have nine compressor stations giving it a capacity of 500 MMCF.

Principal supply for the new line is the José Colomo field, where gas is collected and processed at the C. Pemex adsorption plant (30 Kms. east of Villahermosa, Tabasco state capital). This plant now has a design capacity of 300 MMCF which will be increased to 600 MMCF in 1961.

Starting in the second half of 1961, the new line will also receive gas from fields near Minatitlán. This additional gas will be collected for treatment in an absorption plant now under construction at La Venta, Tabasco; the La Venta plant has an initial design capacity of 100 million CFD.

Compressor Stations. Design work has been started on nine compressor stations to be constructed in 1961; and by 1962, the line is to be operating at full capacity. Stations are being designed for full automatic operation; they may be capable of being con-

Most rugged part of the C. Pemex to Mexico City route was the 35 kilometers passing Tuxpango—Orizaba—and Maltrata. This is a view up the Maltrata slope in the central section.

Generally construction methods matched those in the U. S. Here was an exception; crews excavating the rocky ditch on the steep Maltrata slope.

Add fascinating ruins of Indian culture, monkeys, thatched roofs, Latin rhythms, and tropical vegetation to south Louisiana and what do you have . . . this swampy right-of-way traversed by C. Pemex—Mexico City line just above city of Villahermosa.

Caving ditch is crumbed preparatory to lowering the Pemex gas line during work on a muddy section in the state of Tabasco.

In many swampy areas earth embankments or "terraplenes" were thrown up and dry land methods were used. In deeper, narrower marshes joints of weight coated pipe were welded up on these rollers set on high ground and buoyed string was shoved into dragline excavated ditch.

Pipe stringing on the Maltrata slope. The 18,700 foot Citialtepec, third highest mountain in North America, is seen in the background.

An overbend span of the Pemex line arches the Rio Blanco near the city of Orizaba. Heavy rock-concrete anchor supports line on banks.

Close-up of hand excavation of ditch on Maltrata slope as crews "take a break." Valley in background is several thousand feet below.

Still another type span used on the new Mexican gas line. This steel truss carries pipe across a deep ravine on the Maltrata slope. Eight major underwater crossings were also made by the line.

trolled remotely by a microwave system originating in Mexico City.

Construction Methods. Actual construction of the Pemex line has been handled by three complete pipe line spreads. One spread worked from México City to Minatitlán skipping the Tuxpanga-Maltrata section; another worked for Minatitlán to Pemex City; the third constructed the rugged 35-kilometer Tuxpango-Orizaba-Maltrata section.

Route of the line traversed all kinds of terrain including deep lagoons near Pemex City, swamps between Villahermosa and Minatitlán, flooded areas between Minatitlán and Tierra Blanca, steep ravines subject to flash floods (these were generally spanned), severe erosion between Tierra Blanca and Tuxpango, rocky zones of all

types from gravel to granite, steep slopes, congested working conditions in the heavily populated Orizaba valley, forests, mud and dust, as well as deep earth cracks caused by the severe erosion of the mountains between Maltrata and México City.

Construction methods generally were similar to those used in the United States, however there were some exceptions. For example, in the excavation of several sections of ditch, it was expedient to employ large numbers of laborers instead of mechanical equipment. This was made practical by the plentiful supply of labor available at rates lower than those in the U.S.

Swamp Construction. Because swampy zones were not large and continuous like those of the Mississippi delta, but instead were small, isolated and surrounded by ground more or less firm, the construction procedure was to first provide an earth embankment or "terraplen" approximately 45 feet wide across the shallow swamps. These "terraplenes" were often constructed by drag lines using material borrowed from the swamp bottom on each side of the route. In some cases, however, it was necessary to haul in the fill material due to the unsatisfactory nature of the swamp bottom. After the "terraplenes" were constructed, pipe was laid by ordinary construction methods, using either concrete coated pipe or concrete counterweights.

In deeper swamps, where the "terraplenes" would have been very costly, ditch was excavated by amphibious drag lines. The pipe was then welded together joint by joint on a firm platform at one side of the swamp and floated into position in the ditch with steel drums banded to the top of the pipe. Once the complete section was in position, drums were released in sequence by breaking the bands with a cable stretched between both banks, allowing the weighted pipe to sink gently into place in the ditch.

River Crossings. Route of the Pemex-Mexico City line required eight major underwater river crossings, each having one 24-inch, 0.625-inch wall line and a 12-inch x 0.500-inch line. The longest and most difficult crossing is the Río Tesechoacán, 800-meters long; and this river has a wandering and unstable nature. River lines were buried to a minimum depth of 10-feet below the river bed.

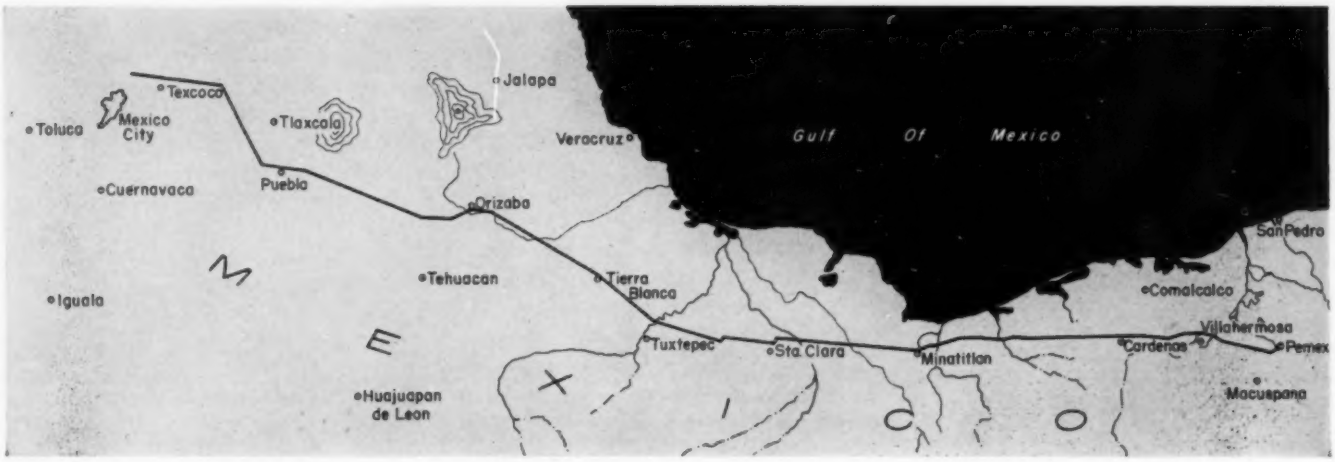
Only two rivers, the Amapa and the Blanco, were crossed with suspen-

Marsh construction on Pemex's new gas line; over 20,000 concrete anchors were used in construction plus 48 miles of concrete coated pipe.

On-the-line cleaning and coating machines applied the coal tar, glass fiber protection system covered with an outer wrap of asphalt impregnated glass wrap. Pemex specifications called for a minimum thickness of 0.125-inch on pipe wall and 0.105-inch over weld.

Bevel is burnished with file on weight coated joints of pipe in marsh work on eastern section of Pemex line.

Weld inspection specified by Pemex engineers called for 100 percent radiographs on river, swamp, and urban zone work; on field welds radiographs were taken on 15 to 20 percent of welds.



Route of the new 24-inch, 484 mile line from Ciudad Pemex in the isthmus gas fields to Mexico City.

sion bridges. Overhead crossings were selected for these rivers because of their rocky stream beds, well defined course, and perfectly stable banks.

Pipe Weighting. For swampy areas, 77 kilometers of pipe was coated with heavy aggregate concrete to provide a negative buoyancy of 1.15. In areas subject to periodic flooding, some 20,000 single and double anchor concrete weights were used to stabilize the line. Underwater river crossing pipe was also covered with heavy concrete.

Ditching at the rivers was accomplished by several methods. In some cases ditch was made by pulling toothed buckets back and forth across the rivers using steel cables worked by heavy winches set on each bank; in other instances by suction dredges or jetting.

Weld Inspection. For all river crossings, swamps and urban zones, a very meticulous visual inspection was performed on the field welds, together with 100 percent radiographs by means of X-rays. On the rest of the line, field welds were also subjected to a very careful visual inspection, but radiographs were taken of only 15 to 20 percent of the welds, by means of gamma rays.

Coating—Cathodic Protection. Corrosion protection is provided on the Pemex line by a layer of coal tar enamel, reinforced with a glass fiber wrapping and covered with an outer wrap of asphalt impregnated glass wrap. Minimum thickness of the protective covering is 0.125 inch on the body of the pipe and 0.105 inch over the longitudinal weld.

As soon as the line is completely finished, this protection will be complemented by a system of cathodic protection using rectifiers and magnesium anodes. This system is presently being designed.

Sectionalization. The C. Pemex-Mexico pipe line is divided into 40 sections by means of 29 section valves and 10 pig traps. In this way, the important river crossings, urban sections, or otherwise critical sections can be isolated. Most of the valves were manufactured in Mexico.

Laterals. Simultaneously with the construction of the main line, a gas gathering system for the La Venta plant, supply laterals and gas distribution systems are being built.

Principal laterals along the line serve a thermoelectric plant at Villahermosa, the Pemex Refinery at Minatitlán, an ammonia plant at Minatitlán, the Pan-American Sulphur plant near Jáltipan, the city of Veracruz, the industrial zone near Orizaba, and the city of Puebla.

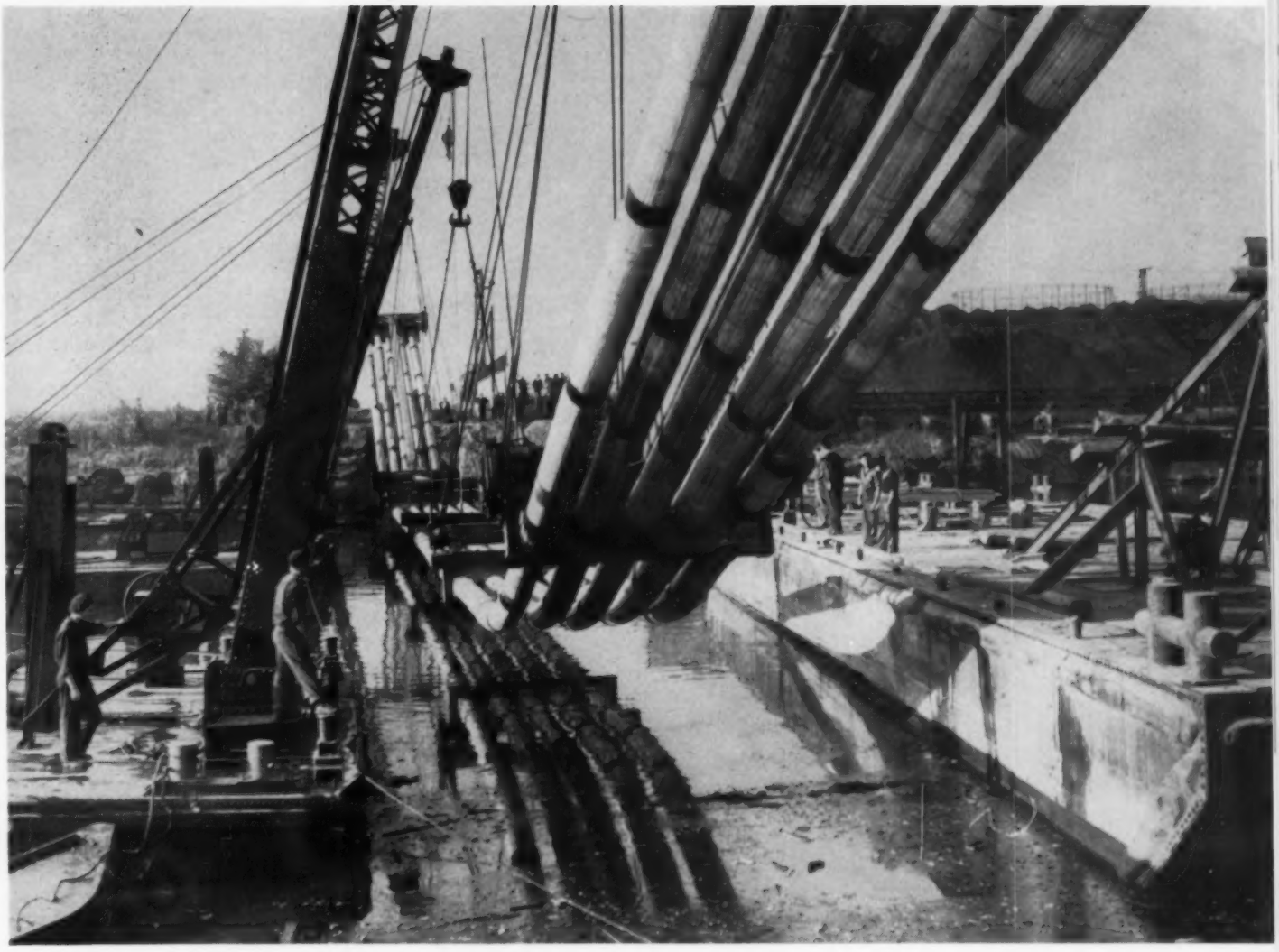
The gas distribution system for the industries in and near México City will have in the first stage of development, approximately 130 kilometers of pipe varying from 24 inch to 2 inch in diameter.

The central zone of Mexico will also be supplied with gas from Pemex City thru this pipe line. Presently under construction is a 14-inch diameter, 165-mile gas line from México City to Salamanca that is scheduled for completion the first part of March 1961. In the initial stage of operation, this line will be able to handle 100 million CFD with only one compressor station located at México City.

Also scheduled for 1961, are laterals to Querétaro and San Luis Potosí, as well as an extension of the main line to Guadalajara.—**The End.**

About the Author

F. Xavier Peredo joined Petróleos Mexicanos in 1951 as a civil engineer. Since 1955, he has been engaged in pipe line design and construction. In 1956, he was in Bartlesville, Okla., with Phillips Petroleum Co. as a Pemex representative in design of the Tampico Monterrey products pipe line. Peredo was made construction superintendent for the Reynosa-Monterrey gas pipe line in 1957, and in 1958, was promoted to general pipe line construction superintendent for Pemex. Peredo is a graduate of the University of Guadalajara and attended the API School of Pipe Line Technology in Baytown, Texas, in the spring of 1957.



INTO THE SEINE goes one of two five-line crossings which were pre-fabricated and lifted into the water in one swift movement.

French Prefabricate Five-Line Crossing of the Seine

River traffic shut down only five hours per crossing

By Anthony Gibbon
Mid-Continent Editor
PIPE LINE INDUSTRY, Tulsa

A FIVE-LINE crossing of the Seine River in Paris was pre-fabricated, barged into place and lowered to the bottom by heavy barge cranes. Although the lines were concrete-coated to provide negative buoyancy, additional weights were used during the sand backfill. After a good portion of the backfill was in place, the weights —which were heavy chains tumbled into large metal boxes at either end of the crossing—were removed. Following the five feet of sand cover, cobble stones were heaped over the crossing as an added protection.

Natural gas is pacing the industrial revolution taking place in France today. A large reserve of gas—7 trillion cubic feet—was discovered in the Lacq field in the Aquitaine Province of southwest France. But as with all natural gas, its utilization depends on a system of pipe lines. For the gas to

MULTIPLE CROSSING WAS FABRICATED on barges some distance from the crossing site. This 426-ft crossing now spans the Main Arm of the Seine in Paris. The clamps were made of structural steel with wooden spacers in between.

READY FOR LOWERING INTO PLACE. Note the bracing at either end which enables the cranes to lift the pipe assembly without danger of deformation.

reach Paris, several French rivers including the Garonne, Saone, Rhone, Loire and the Seine had to be crossed.

The most interesting of the river crossings was that of the Seine at Paris. The point selected was at Gennevilliers facing a coking plant where the Island of Saint-Denis divides the river into two channels. The smaller arm is 295 feet wide and the larger is 426 feet wide. Both channels were crossed in 14 feet of water. A chalky bed presented excavating problems, but H. Courbet Enterprises, engineers in charge of the crossing, dredged an 11-foot trench below the river bed. Using lighters and floating cranes engineers successfully spanned both arms of the historic Seine. The crossing was scheduled so that river traffic suffered little disruption during the operation.

Five pipe lines were used to cross the Seine. Two were 15.75-inch O.D. and three were 11.81-inch O.D. To overcome negative buoyancy, the lines were concrete-coated.

The two crossings—the 295-foot Little Arm and the 426 Main Arm of the Seine at Gennevilliers were made in similar fashion. Both were fabricated atop barges at a site downstream. As the lines were assembled, they were clamped together by spacers fabricated from two welded Larssen pipe-planks and a U-iron with wooden inserts to protect the pipe surface. A lathe corset was banded about the line for added protection.

Scaffolding at either end of the U-shaped crossing was used during fabrication and transportation to the crossing site. To make the big lift from the pontoons or barges, structural steel bracing was added to the upper side of the crossings. French pipeliners call this assembly a "rocking arm" and with one at either end, the barge cranes were able to lift the entire multiple-crossing without deformity.

The day before the lines were to be laid in the trench, four floating mast-cranes of 50-tons capacity each were spotted perpendicular to the lines. Each was fitted with a hinged lever connected to the lifting hook by three sets of slings.

Traffic on the Seine was stopped for four hours. At the appointed time the downstream portion of the pipe was driven into the approach on the left bank. Tug boats then pivoted the

SWIMMING UP THE SEINE like a weird herd of sea-monsters, the crossing moves into place.

TWO BOXES OF CHAIN (one is at the center of the photo) were used to give the crossing some 14 tons of added weight until backfill could be initiated. The lines were covered with five feet of sand, and topped off with cobble stone.

LINES GO INTO PLACE. This structural brace was dubbed a "rocker arm" by French pipeliners.

mast-cranes and pipe lines out into the river. As soon as the lines were positioned over the bed the cranes lifted them along enough for the pontoon sections to float free. The pipe was then lowered to water level and seven tons of chains were placed in metal baskets at the bottom of each. When the lines were in the trench divers unhooked the slings and levers and picked up the chains. A layer of sand five feet thick was forced around the pipes and a cobble stone bed over the sand completed the filling of the trench. **—The End**

French Pipeliners Put the Finishing Touches on Two More Sahara Lines

The 16-inch line that runs from Relizane to Affreville was constructed under difficulties. Temperatures during day time ran as high as 110° F in the shade; much of the ditch had to be blasted through rock and the line had to be guarded against rebels at night.

Welding on the 24-inch main gas line that runs from Hassi R'Mel to Relizane. The pipe was manufactured in France according to API X52 specifications. Welds were X-rayed and the line was hydrostatically tested.

Three 24-inch pipe lines will bring crude and gas from Algerian fields to the Mediterranean coast

FRENCH PIPELINERS are winding up construction on two more Sahara pipe lines. This will make three 24-inch pipe lines running from the interior of Algeria to the Mediterranean coast. Two are crude lines and already in service. The third is a gas line scheduled to go in service early in 1961.

The impact on the economy of western Europe will be great. Crude deliveries will likely approach the 300,000 barrels-per-day mark late next year and more lines will follow as additional fields are discovered. But it is the gas line from Hassi-R'Mel field of North Central Algeria that holds the greatest promise. It will bring a cheap fuel supply for northern Algeria which undoubtedly will attract industry. Too, French engineers are devoting a great deal of thought to finding a means of pipelining a sizeable portion of the gas to Europe. Recently, they initiated a series of deep-water tests for pipe lines with an eye toward laying a line across a 77-mile section of the Mediterranean. They are also toying with the idea of installing a liquefaction plant on the coast to enable them to ship liquid methane by ship or barge.

THE CRUDE LINES

Algeria's first major crude line was a 412-mile 24-inch line from the Hassi-Messaoud field to the Mediterranean port of Bougie in eastern Algeria (See April, 1960 PIPE LINE INDUSTRY pages 36-39). This line is owned and operated by Societe Petroliere de Gerance (SOPEG) which is owned 50-50 by Compagnie Francaise des Petroles and Societe National Repal. Work on the system has been completed and deliveries run as high

Loading out the 24-inch pipe for the main gas line. Trailers were capable of hauling up to 40 tons of pipe over long distances.

Pipe has been primed and here comes the coating and wrapping machine. Note that the pipe is being cradled into the ditch.

Trailer camp for constructors of the Relizane to Affreville 16-inch line.

Close-up of cradling the pipe into the ditch from the coating and wrapping machine. Note the holiday detector being run along at ground level.

as 120,000 barrels of sweet crude per day. If the reserves along the route are increased, horsepower can be added to bring the daily deliveries up to 160,000 bpd.

The newest crude line was laid to provide an outlet for the Edjeleh-Zarzaitine-Tiguentourine fields of eastern Algeria. These fields were discovered by Compagnie de Recherche et d'Exploitation Petroliere au Sahara (CREPS). To operate and supervise the line, CREPS organized a subsidiary company, Societe des Transports Petroliers au Sahara (TRAPSA).

Companies Involved in Construction and Engineering. Preliminary engineering was done by OTP (Omnium Technique des Transports Par Pipelines); and contracts for construction were awarded as follows:

GREP, a joint venture between Societies Entrepose and Parisienne Pour L'Industrie Electrique was given the job of constructing the 310-mile Tunisian part of the 24-inch line that begins at the international boundary between Tunisia and Algeria and runs to Skhirra on the Tunisian coast between Sfax and Gabes. Work on this section of line was completed last spring. GREP also constructed the gathering system in the fields.

Societe des Grands Travaux de Marseille handled the 166 miles of 24-inch line in Algeria along with Enterprise Moderne de Canalisations. Trapegaz and Societes Commerciale et Miniere Pour L'Afrique du Nord and the Eau et Assainissement.

Pipe. All of the pipe was manufactured by French plants according to API X-52 specifications. The joints were about 40 feet long and wall thickness varied from 0.285 to 0.411 inches. All of the pipe traveled by water as far as Sfax, then by rail to a pipe yard just north of Gabes. There, the pipe was double jointed by U.S. made automatic double-jointing equipment.

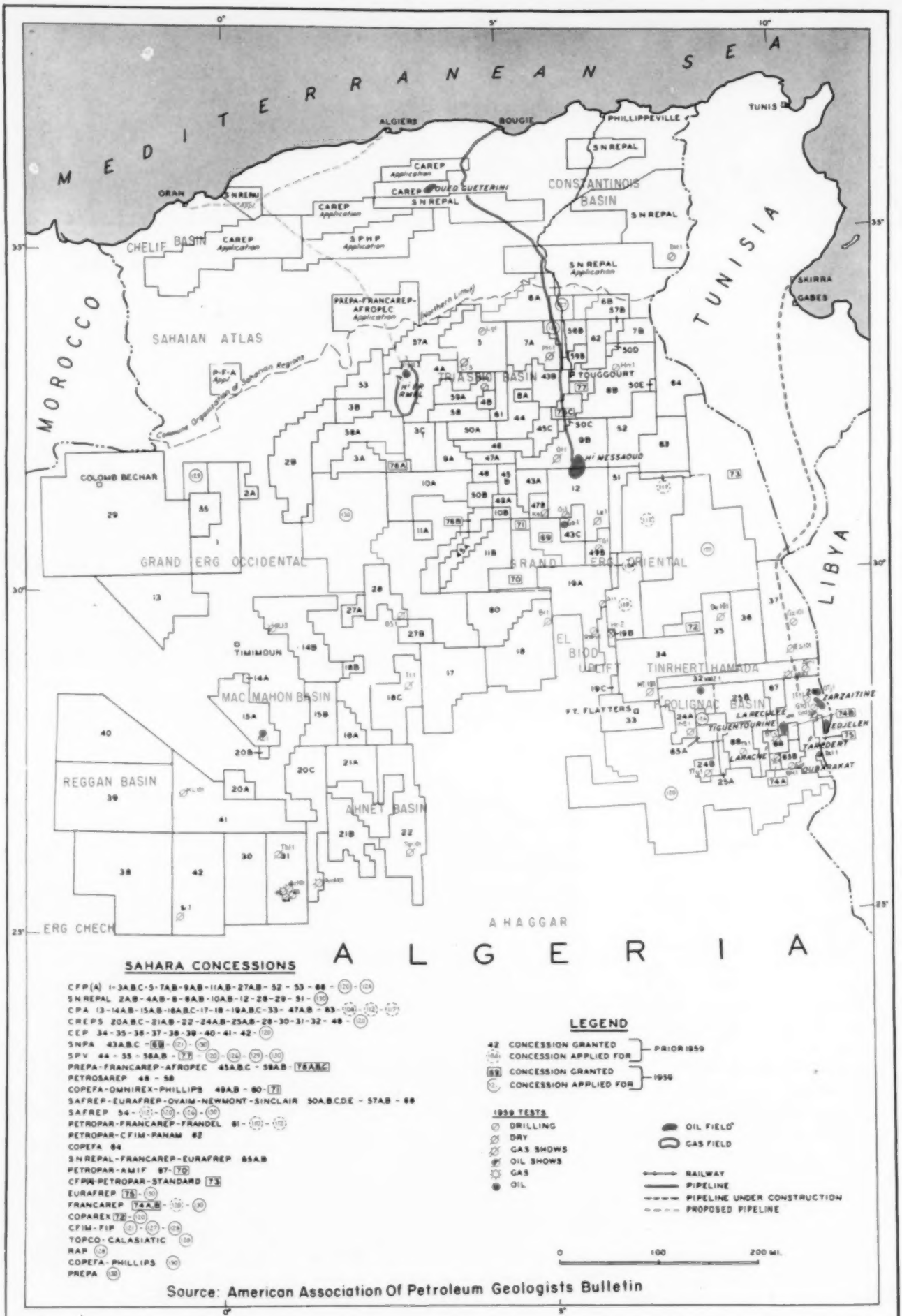
Stringing was done by heavy-duty trucks which could handle loads weighing up to 40 tons in all kinds of terrains encountered along the right-of-way.

Field practices on both spreads were somewhat similar to these of the U.S. After bending, the pipe was welded up and X-rayed. It was then coated and lowered-in. Where the ditch warranted it, sand padding was used.

Testing. The lines were hydrostatically tested to a pressure 10 percent above the maximum working pressure.

Scope of the job can be judged by the amount of equipment and progress made by the consortium of Enterprises group—The Society of Grands Travaux, etc.:

Bulldozers (heavy duty)	10
Shovels (¾ to 1½ cu. yd.)	12
Sideboom tractors	19
Truck tractors	20
Oilfield bed trucks	15
Trailers for camp	80



SAHARA CONCESSIONS

CFP(A) 1-3A.B.C-5-7A.B-9A.B-11A.B-27A.B-52-53-66-(70)-(124)
S.N.REPAL 2A.B-4A.B-6-8A.B-10A.B-12-28-29-31-(130)
CPA 13-14A.B-15A.B-16A.B.C-17-18-19A.B.C-33-47A.B-63-(104)-(112)-(117)
CREPS 20A.B.C-21A.B-22-24A.B-25A.B-26-30-31-32-48-(120)
CEP 34-35-36-37-38-39-40-41-42-(129)
SNPA 43A.B.C-69-(121)-(90)
SPV 44-55-58A.B-77-(122)-(124)-(129)-(130)
PREPA-FRANCAREP-AFROPEC 45A.B.C-59A.B-76A.B.C
PETROSAREP 48-58
COPEFA-OMNIREX-PHILLIPS 49A.B-60-71
SAFREP-EURAFREP-OVAIM-NEWMONT-SINCLAIR 50A.B.C.D.E-57A.B-68
SAFREP 54-(117)-(120)-(124)-(130)
PETROPAR-FRANCAREP-FRANDEL 61-(102)-(112)
PETROPAR-CFIM-PANAM 62
COPEFA 64
S.N.REPAL-FRANCAREP-EURAFREP 65A.B
PETROPAR-AMIF 67-70
CFP(A)-PETROPAR-STANDARD 73
EURAFREP 75-(90)
FRANCAREP 74A.B-(108)-(30)
COPAREX 72-(110)
CFIM-FIP (21)-(127)-(128)
TOPCO-CALASIATIC (28)
RAP (18)
COPEFA-PHILLIPS (90)
PREPA (30)

LEGEND

42 CONCESSION GRANTED — PRIOR 1959
(104) CONCESSION APPLIED FOR — PRIOR 1959
69 CONCESSION GRANTED — 1959
(72) CONCESSION APPLIED FOR — 1959

1959 TESTS
- DRILLING
- DRY
- GAS SHOWS
- OIL SHOWS
- GAS
- OIL

OIL FIELD
GAS FIELD
RAILWAY
PIPELINE
PIPELINE UNDER CONSTRUCTION
PROPOSED PIPELINE

0 100 200 MI.

Source: American Association Of Petroleum Geologists Bulletin

The spreads commenced laying the line in August 1959, and finished April 15, 1960. The line went into operation October 1, 1960.

GAS PIPE LINE From Hassi R'Mel to the Mediterranean

In November 1956, S. N. Repal discovered what seems to be one of the world's very largest gas fields, the Hassi R'Mel in North Central Algeria. French engineers have estimated the reserves at something like 70 trillion cubic feet with 2 billion barrels of natural gasoline and liquids.

To get a better idea of the size of this field keep in mind that the total gas reserves of the U.S. have been estimated at 263 trillion cubic feet or only 3½ times greater than this one field.

The decision to construct a gas line from Hassi R'Mel to Arzew was made in the spring of 1959, and the prime contract for its construction and subsequent operation was awarded to SOPEG, which also had supervision of the crude line from Hassi-Messaoud to Bougie.

The engineering work on the project went to OTP (mentioned above) and contracts for its construction were awarded to three companies:

GREP was awarded the contract for the 24-inch line from Hassi R'Mel to Tiaret, a distance of about 210 miles through the Sahara.

SOCOMAN—a subsidiary of Compagnie de Pont-a-Mousson— was given the job of constructing the 24-inch line from Tiaret to Relizane and the 20-inch line from Relizane to Damesme.

Societe des Grands Travaux de Marseille is finishing construction on the 110-mile, 16-inch section of gas line that runs from Relizane to Affreville. This line will be extended on to Algiers by the time the system goes into operation.

The 16-inch line was laid by Grands Travaux in conjunction with l'Enterprise Moderne de Canalisations, CA.P.A.G. associated with their common subsidiary, Societe TRAPEGAZ of Paris. The owner company of this section is Electricite et Gaz d'Algerie, a national Algerian company.

This section of the line was constructed under difficulties. Much of the ditch had to be blasted through rock; the temperature during the day ran as high as 110F in the shade and

Map of the 24, 20 and 16-inch system that will bring natural gas from the giant Hassi R'Mel field. This field has reserves estimated by French engineers to be about 70 trillion cubic feet. This compares with total U.S. reserves of 254 trillion.

guards had to be mounted to prevent sabotage by Algerian rebels.

The pipe was manufactured in France according to API LX52 specifications, and the wall thickness throughout corresponds to a working pressure of 70 kg per sq. cm—or about 1000 psi.

The wall thickness on the main line was varied in much the same manner as called for in the ASA B 32 section 8 piping code. Wall thickness of the 24-inch line was divided into three categories as follows:

Category I—12 mm wall thickness
Category II— 9 mm wall thickness
Category III—8.5 mm wall thickness (desert zone)

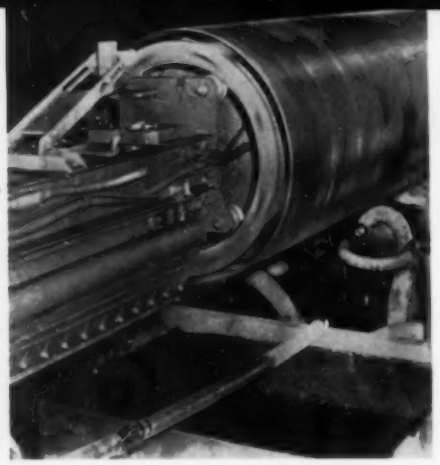
For the 20-inch, Category I called for 10 mm w.t. and Category II called for 7.5 mm.

Compressor Stations. As shown on the map, compressor stations will be spaced about 68 miles apart. When constructed, they will be located at Laghouat, Tiaret and Relizane.

Block valves which are full opening to pass scrapers were installed at intervals similar to those found in the U.S.: about 36 miles apart in the desert, otherwise 18 miles apart. The valves are designed to close automatically on low gas pressure.

Initially, the line will operate solely on field pressure: 1,000 psi at Hassi R'Mel. When the demand increases, a station will be constructed about mid-way between Laghouat and Tiaret. The other three compressors will be needed if gas is to be exported. (Plans call for a methane liquefaction plant to be constructed at Arzew.)

Welding on the main line has been completed and it is complete for the most part. First deliveries should come about April 1, 1961.—**The End**



The first step in the new process for the internal coating of line pipe is wire brushing and scrubbing with a hot cleaning solution. The pipe itself rotates as the brushing mechanism above moves back and forth through it.

Pipe Internally Coated At the Mill

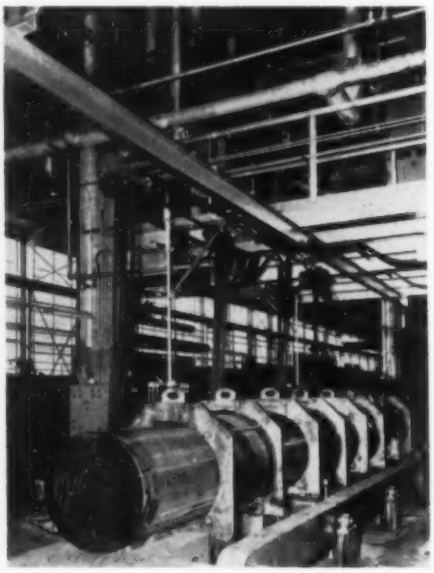
Coating is phased in with other steps in pipe manufacture at A. O. Smith's Milwaukee plant

INTERNAL COATING has been added to the assembly-line manufacture of pipe at the A. O. Smith Corp. mill in Milwaukee, Wis. The coating set-up was designed to handle pipe in sizes ranging from 16 to 30 inches in diameter.

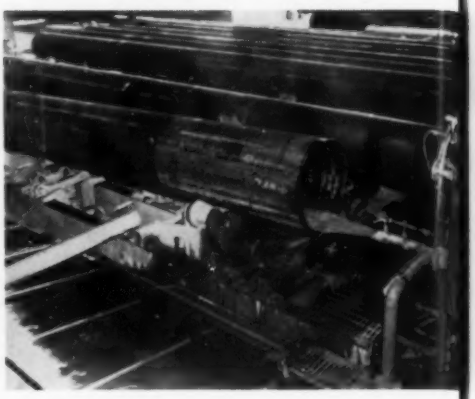
The coating operation incorporates several new techniques and quality controls. Here is the coating process broken down into its five principal steps:

1. The pipe—while rotating—is thoroughly wire brushed and scrubbed with a hot cleaning solution.
2. It is then flushed with hot water and dried with hot air.
3. In-line induction heaters further raise the temperature of the pipe to facilitate complete moisture removal and speed curing of the epoxy-base paint.
4. Spraying is done with modern hydraulic equipment under a venting hood.
5. Conveying is mechanical and railroad cars are crane-loaded—all within a fully enclosed plant building.

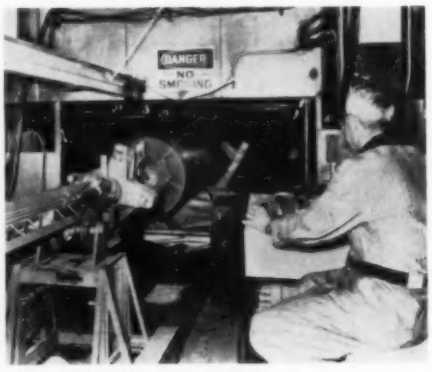
—The End



Electric induction heating raises the temperature of the pipe to facilitate complete moisture removal and assure faster curing of the epoxy-base paint.



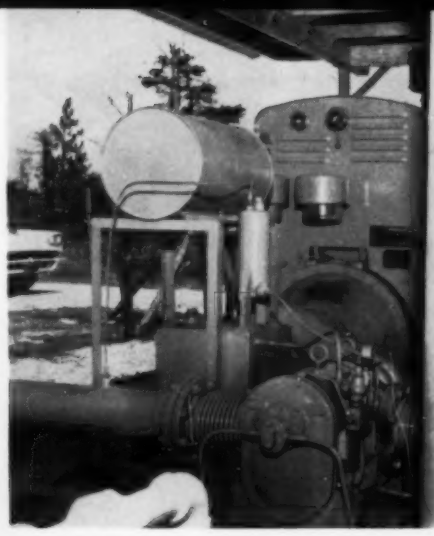
Hot water flushing is the second step in the internal coating process. After the flushing, the inside of the pipe is preliminarily dried with hot air.



The actual spraying is done with modern hydraulic equipment that moves through the pipe under a venting hood. A multi-nozzzle spray head operates as the pipe rotates.

Several powerful blowers, operating under a venting hood, remove thinner solvent vapors after the spraying. The pipe here is shown just as it is leaving this stage.

A smooth interior surface is the final product. Exact composition of the coating and application methods are specified by the line pipe customer.



AN AXIAL COMPRESSOR UNIT which boosts gas pressure from about 25 psia to 50 psia on the West Lateral of Shell's Little Creek, Miss. processing plant. This unit handles 438 cfm. Inspecting the unit is Foreman L. J. Whaylen.

A CLOSE UP of the 438 cfm axial compressor, believed to be the first in this type service. The compressor is 31 inches long, 14 inches wide and 18 inches high. It weighs 500 pounds.

Packaged Axial Compressors Make Debut On Shell Gathering System

Compression ratio: 2 to 1; discharge pressure 50 psi

THREE PACKAGED AXIAL COMPRESSOR UNITS are boosting gas pressure on Shell Oil Company's gas gathering system at Little Creek, Miss., which feeds a new processing plant that handles 5 MM cubic feet of gas per day.

The compressors are high-speed, helical-type positive displacement rotary compressors. The external drive powers the main lobe in each unit that mates with a gate rotor drive through timing gears from the main rotorshaft.

On the intake side, gas flows into the expanding cavity as the rotors open away from each other. The gas then is carried around the outside of the rotors to the discharge side and is compressed smoothly in a diminishing chamber as the rotors mate. This screw action of the helical rotors produces a smooth flow and permits the greatest output per pound of compressor ever achieved in a positive displacement unit.

The 438-cfm compressor is just 31 inches long (from end of rotor shaft to end of compressor) 14 inches wide and 18 inches high and weighs less than 500 pounds. It is driven by a 6-cylinder 5¼ x 6-inch natural gas engine turning at 1,400 rpm to run the compressor through V-belts at 2,920 rpm. Engine capacity provides substantial reserve above the horsepower requirements of the compressor. The skid-mounted package requires little or no foundation. In this case, Shell has bolted it to a light concrete slab and sheltered it with a sheet-metal roof.

The three compressors went into service late in July 1960. The larger unit serves an 8,000-ft. 6-in. line gathering gas from 12 wells. Gas passes through a scrubber to the compressor which discharges into a 10-inch line for the last 3,400 feet to the plant. A 217 cfm unit ties into the Northeast Lateral, a 5,500-ft 6-in. line and the other small compressor is on the 5,000-ft. Northwest Lateral of 4 and 6-in. line.

The compressors are started manually at the booster stations, but once in operation the units are self-sufficient. Engines have fan cooled radiators and makeup water for the cooling systems is provided automatically by small exhaust condensers. Each engine is arranged to shut down if jacket water temperature goes too high or lube oil pressure fails.

No lubrication is required in the compression chamber of the axial compressor since there is no metal-to-metal contact between the two rotors or between rotors and housing. The timing gears are enclosed in a separate oil-tight compartment and the rotor shafts are supported by antifriction bearings in oil-tight heads outside the main housing. Normally, the size 450 and 562 compressors have splash-type lubrication for gears and bearings. In this installation, two of the three units are equipped for force-feed lubrication with a shaft-driven pump to circulate the oil.

For natural gas service, all three compressors have oil-pressurized mechanical seals with rotating carbon faces. Included in each system are a pump, filter, oil cooler and sump tank. Safety switches shut down the engine if compressor bearing oil or seal oil pressure drops.

The stations have a full complement of safety devices. The engines shut down automatically if gas discharge temperature or pressure go too high. In addition, there is a pressure relief valve on the discharge set 5 pounds above the engine shutdown switch. Also, there is an automatic shutdown activated by low suction pressure to avoid pulling a vacuum on the gathering lines. **The End**

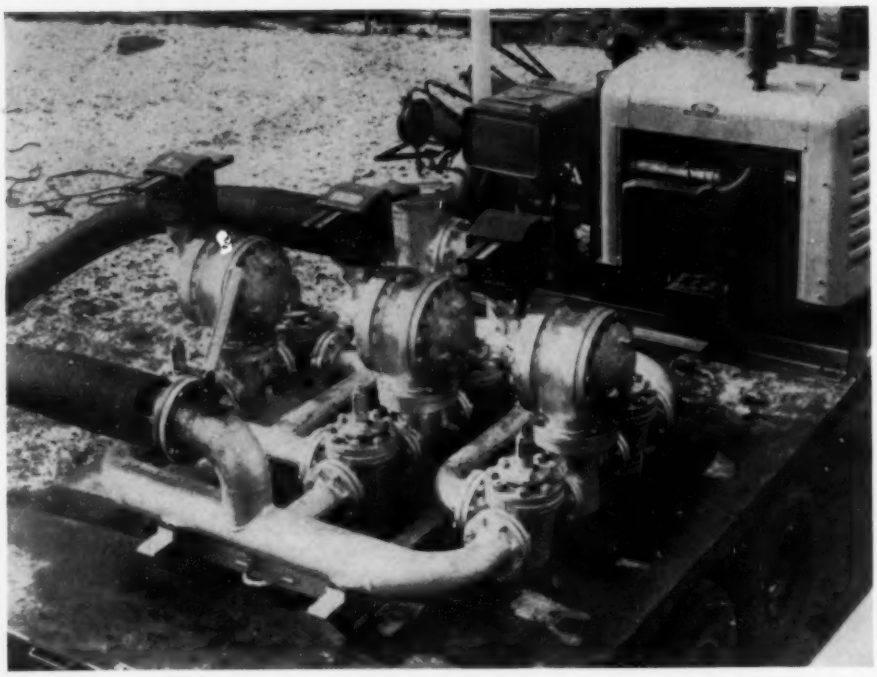
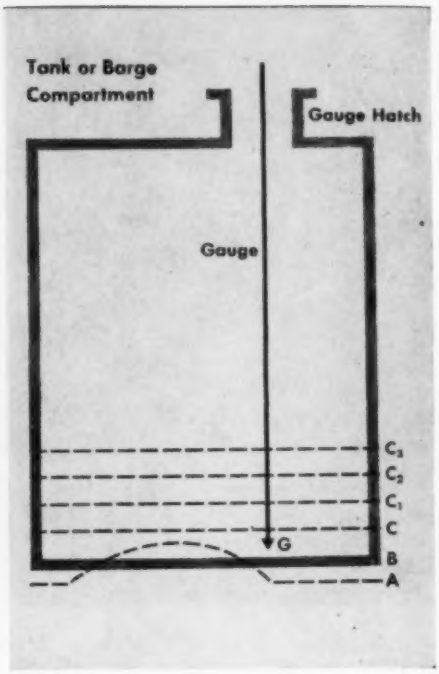


FIGURE 1—Mobile unit for metering tank capacities speeds recalibration. The unit is complete with pump, three meters and multi-port valves to control operation.



Photographs Courtesy Rockwell Manufacturing Co.

FIGURE 2—How to calibrate for effects of bottom flexings, dents, etc. on gage readings. C-C represents point at which coverage of bottom is complete. This depends on bottom flexure.

New Metering Idea

Mobile Metering Unit For 'Strapping' Tanks

TRADITIONAL TANK recalibration involves laborious "strapping" to pick up dimensional measurements followed by the working of complex formulae in order to fully provide for all tank conditions and contour irregularities likely to be encountered. Here is a simpler and more accurate method of performing this task.

Using a mobile measuring unit, built around accurate calibrated meters with a simple but flexible valving set up, B. J. Donnelly of Shell Oil Company devised an economical means of recalibrating tanks. The method has a number of advantages:

1. It makes it easier to establish tank gage tables.
2. It makes the determination of capacities of odd shaped containers more accurate.
3. It takes into account the volumetric effects of static irregularities in the tank bottoms, out-of-round contours and tilted tanks.
4. It eliminates errors due to inaccuracies caused by bottom flexing under varying load conditions and non-stable bearing surfaces.
5. It makes it easy to obtain coefficients of error applicable to current barge compartment gage tables.

Equipment Description and Operation. The meter calibration unit consists of two skid-mounted packages, mounted on a truck. One is the power unit with a 147-hp gasoline engine which drives a 1,500 gpm capacity pump with 6-inch suction and discharge. The second package consists of meters, valves and piping. Specifically, there is a 6-inch inlet and 6-inch outlet header connected by three 4-inch lines. Each line contains a 4-inch meter with a single strainer upstream. There is a three-way valve upstream and downstream of each meter, permitting the individual meters to be operated in parallel or in series. Thus, one meter can be held in reserve as a master or "proving" meter, to be intermittently connected in series to either of the other two meters "working" in parallel.

Standard preliminary procedure calls for the establishment of the calibration factors for each meter based on rate of flow, temperature and specific gravity. These coefficients are verified by means of a meter "prover" before the unit is used.

The liquid to be used for calibrating is circulated within the unit for

Continued on Page 38

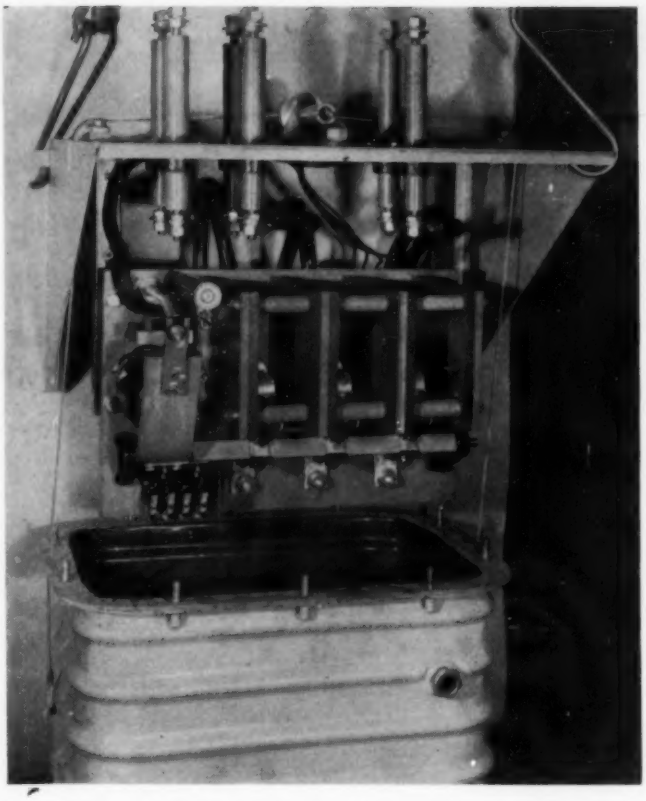


FIGURE 1—New oil contactor with a maximum rating of 400 amps, 5 kv, 50,000 kva interrupting capacity and requiring only 30 gallons of oil designed for Class 1 Group D, Divisions 1 and 2 hazardous locations. It may also be used in contaminated atmospheres or where dust is a problem. The contactor itself is completely immersed in oil. The creepage to ground between phases is less than in air. The principle of arc interruption is entirely different from air interruption. When the contacts part in oil, an arc is drawn and heat from the arc causes a gaseous bubble to form under the oil. Since the bubble is lighter than oil, it begins to rise vertically. Its size depends upon the arc energy to be dissipated. The sudden expansion is transmitted hydrostatically to the tank as a pressure wave. The heat within the bubble is absorbed by the oil, causing a small amount of oil to break down and form carbon, which is an oil contaminant.

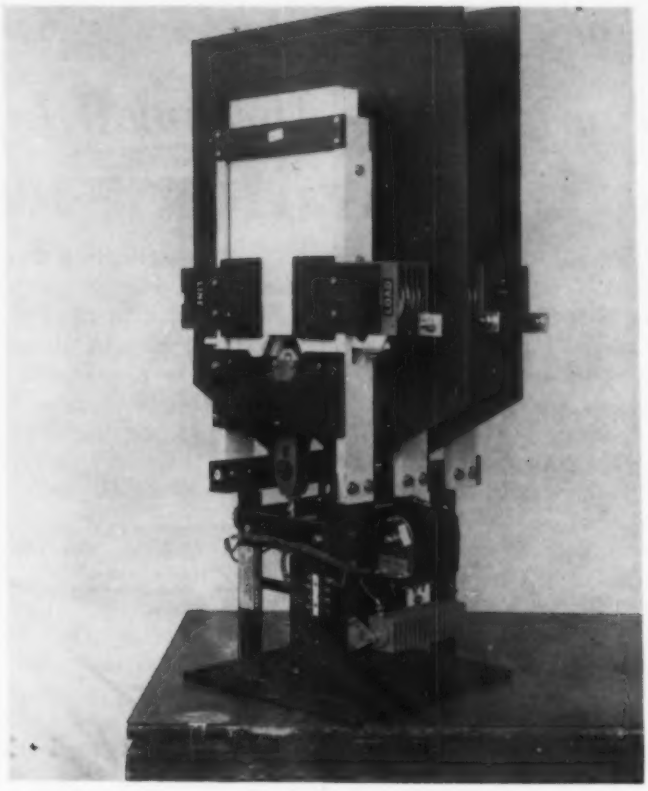


FIGURE 2—Air contactor with the same maximum ratings has proven its value in applications requiring highly repetitive duty. Since it is primarily designed for normal operating conditions, the contactor is widely used in all types of industries. The movable and stationary contacts of the air contactor are held by insulated supports. Electrical creepage across clean, dry non-tracking insulators must be at least 3½ inches. The through-air spacing of live parts opposite polarity must be two inches. In order to obtain the proper insulation level, most air contactors are of open design and have few flat surfaces to collect contaminants, such as dust and moisture. Since the arc energy must be dissipated in air, the critical design problem is arc extension in the blowout structure and arc chutes. Further, the ionized gases must be dissipated within the enclosure. For this reason the control components must be mounted away from the gas blast area.

Which Contactors to Use For Medium Voltage Control-Oil or Air?

A new oil contactor bringing up a choice for electrical engineers

By H. A. Wright
Control Department
Allis-Chalmers Mfg. Co.
Milwaukee, Wisconsin

ADVENT OF A NEW oil contactor in a size and rating corresponding to air contractors opens new possibilities for reliable voltage control in areas where air contactors were previously the only choice.

Of course the question as to whether oil-immersed or air contactors should be used on two to five-kv motors cannot be answered without complete knowledge of the application and the environmental conditions.

Air contactors and breakers were first used in the early 1940s. Before then only oil-immersed equipment was available. During the war years as distribution system capacity increased, oil switchgear could not be readily replaced, even though some breaker ratings were below the system short-circuit capacity. While properly ap-

Longer Contact Life with Air; Oil Provides Long Mechanical Life

plied oil circuit breakers were thoroughly reliable, air circuit breakers were introduced because they were easier to maintain and provided faster interruption. Oil switchgear was replaced with new air gear of proper capacity.

The drive for air switchgear resulted in some prejudice against oil and in many cases air contactors were used where perhaps oil should have been considered. Since the war development has been aimed at producing reliable air contactors with a maximum rating of 400 amps, five kv, 50,000 kva in a small package.

The petroleum industry had a requirement for medium voltage control to be installed in hazardous gas atmospheres. Oil-immersed equipment was the only practical answer to these applications. Little choice in size and rating had been available. The industry therefore requested that a new oil contactor be developed having the same maximum rating as the air contactor and housed in a small tank which could be mounted in a normal cubicle with fuses. Such a conductor, Fig. 1, has now been developed. Fig. 2 shows the comparable air contactor.

About the Author

H. A. Wright was graduated from Carnegie Institute of Technology in 1933 with a B.S. in electrical engineering. He joined Allis-Chalmers in 1937. From 1941 to 1946 he was in the armed services where he served as a colonel in the Signal Corps. In 1946 he became staff engineer in A-C's Control Department and is now supervisor responsible for the design of motor control.

Application Determines Contactor Type. For highly repetitive service air contactors are preferred, but for hazardous atmospheres oil contactors are recommended. Since an oil contactor is now available having the identical rating of the air contactor, there are many applications where either air or oil contactors may be used.

Until now, only air contactors have been available in the new, fused front-access starters such as might be applied to a 1,000-hp, 4,160-volt synchronous motor.

Oil contactors might be selected for a pump where the atmosphere may be contaminated with corrosive elements plus water vapor. If the pump operates for days without stopping, oil should be considered. However, if the pump is operated on two-wire control from a pressure switch, air is a better choice, since the duty may be repetitive.

Advantages of oil and air contactors are listed below. This should assist the operator in determining where oil or air contactors for medium voltage control can be best applied.

OIL ADVANTAGES

1. Does not give off gas blast
2. Does not require space for gas diffusion
3. Replacement of parts less expensive
4. Easy to service once tank is dropped
5. Not affected by dust or corrosion
6. Long mechanical life
7. Can be used in hazardous areas.

AIR ADVANTAGES

1. Longer contact life
2. Cleaner maintenance
3. No oil to test and maintain
4. No oil to change
5. Negligible fire hazard
6. Designed for reversing jogging service
7. Good for highly repetitive service.

—The End

Mobile Metering Unit

Continued from Page 36

a sufficient time to bring the meters and parts to approximate operating temperature and particularly to purge the equipment of air pockets and vapors prior to discharge. Care must be exercised to eliminate all excessive splashing.

If there is a difference between the temperature of the product at the calibration unit and at the vessel, the metered quantity must be adjusted. Apply a temperature correction factor based on the difference in the two temperatures multiplied by the coefficient of expansion of the product added to or subtracted from the base of 1.0000. If the product temperature is greater at the tank, the metered quantity is increased, etc.

Establishing Coordinates. Figure 2 indicates the procedure used in establishing required reference points in tank calibration. *B* represents the presupposed base of tank or compartment. From visual inspection, evidence of bottom flexure is represented by *A* Line. *C* represents the point at which coverage of the bottom is complete. Point *G* represents the 0′0″ gage established in the tank gage table.

When these coordinates are established, pumping is started until, by visual inspection, sufficient product has been introduced into the vessel so that point *G* is awash. Meter filling is stopped, the meter readings are taken and the liquid quantity temperature adjustment between meter and vessel is made. This is noted as the 0′0″ tank gage.

Pumping is then continued until *C* is reached. From there on, *C*1, *C*2, *C*3, etc., are established until such time that all bottom flexing due to liquid head variations ceases, or until structural irregularities have been submerged. After each increment, the meter filling is stopped, and the reading and corrections are made as outlined previously.

If a new gage table is to be made, the metered quantity is established as the 0′0″ gage. All quantity data on the new table from 0′0″ up to final *C* liquid level should be based on the meter filling data. Quantities above this point may be based on gage table increments or new strappings.

—The End

Tips That Can Improve Your Microwave System

Keep records so trouble can be spotted before it develops. Maintenance men should commit block diagrams and maintenance routines to memory

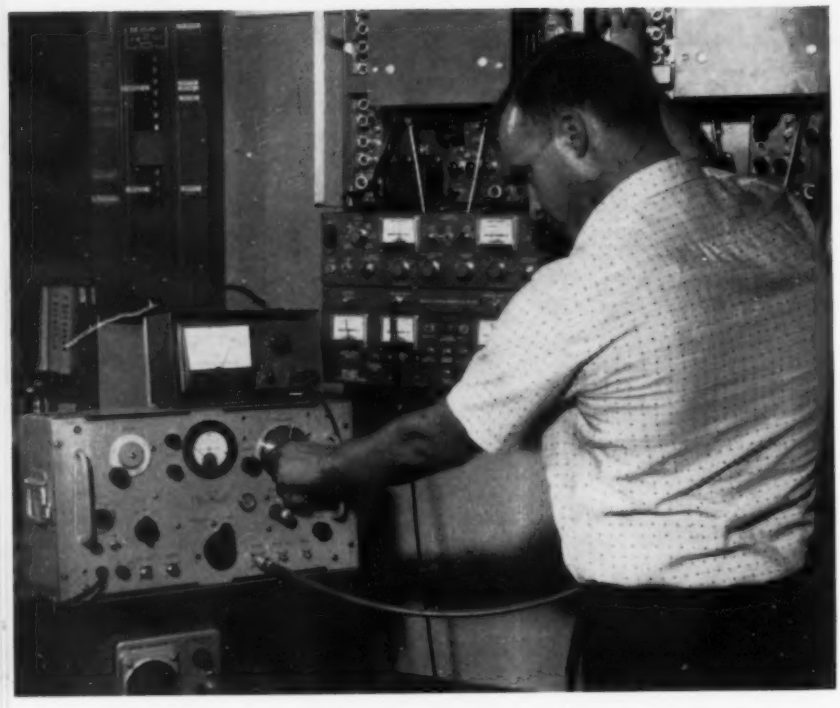
By Harold E. Smith
Senior Reliability Engineer
Microwave Division
Motorola, Inc., Chicago

MAINTENANCE OF A MICROWAVE SYSTEM begins with well-kept records which contain sufficient data for predicting component and unit failures. This permits corrective actions to begin before an outage or malfunction occurs.

Records of meter readings taken during routine visits to each station supply accumulative data which is necessary to evaluate system and unit performance. This information, when correlated with expectations and past experiences, points out potential failures. The data taken during the initial installation provides a continuous reference.

How to familiarize yourself with the equipment. For efficient preventive and corrective maintenance, thorough familiarization with the equipment and system is a necessity. One way to get to know the equipment well is to break it down to its simplest form. Begin by drawing, then memorizing the system layout. Next, draw a block diagram of the equipment at each station. After determining the complete functions of each unit, study the unit itself. Determine

Check towers for alignment (particularly after storms) for rust, and tension of guys. Author recommends that every maintenance man commit station block diagrams to memory to facilitate trouble shooting.



Check power of transmitter and receiver to determine antenna alignment requirements.

Transistorized test equipment is handy. Each maintenance man should be equipped with about $10,000 worth of test equipment to be effective. Insufficient test equipment can lead to needless hours of system outages and increased man hours of maintenance time.

the input and output signals of each unit. After this, draw the entire system in block form from memory. Include all stages and test points of each unit. Place levels and waveforms wherever possible on the drawing. When this has been done, the operator will need to spend very little time localizing and correcting problems on the system.

Keep thorough radio logs. The Federal Communications Commission states that pertinest details of all services and maintenance performed which may affect the proper operation of a station are to be entered into the log book or maintenance records. The FCC states these records are to be kept at the station for one year. Due to the long-life components used in microwave communications systems, it is advisable to keep these records on hand for three years. The logs may be kept in two separate parts, a maintenance section and an operating section. The operating section contains information pertaining to routine adjustments, meter readings and tower light checks. The maintenance section would then cover any repairs or corrective actions taken.

The FCC also requires that an inventory of spare tower lamps on hand for immediate replacement be listed in the log book. Along the same line, it may be well to enter an inventory of spare tubes and fuses. According to the standards of good engineering practices, a minimum number of spare tubes are to be kept on hand at each station for the radio and test equipment. Table 1 shows these minimum recommendations.

Table 1

TUBES OF EACH TYPE USED	MINIMUM SPARES REQUIRED
1 or 2	1
3 to 5	2
6 to 8	3
9 up	4

System levels. The multiplex injection levels per channel on a system are calculated for optimum results taking into account a *fade margin, intermodulation products* and *intrinsic noise*. The system is to be kept at unity gain and unity deviation to acquire these optimum results.

Do not mistake unity gain for unity deviation. Unity gain can be achieved by overdeviating or overmodulating the transmitter to compensate for a receiver with a low output. Unity gain exists when the output of a receiver is equal to the level applied to the transmitter at the preceding station. In order for unity deviation to exist, the deviation of the transmitted carrier at a repeater must equal the deviation of the received carrier. Some method of checking the deviation of the transmitter should be used periodically. If a modulation test set is available, one man can check the deviation of the transmitter locally and adjust for unity deviation through a repeater. In lieu of a complete modulation tester, a deviation calibrator test-set may be used for adjusting or calibrating the receiver outputs with a standard signal. With all of the receivers calibrated, the system can then be adjusted for unity deviation by adjusting the transmitters to the proper level measured at the receivers. With a properly adjusted system, the operator will have unity gain and unity deviation congruently.

When overmodulation or overdeviation occurs, the signal-to-noise ratio on the channels will decrease because of crosstalk and intermodulation distortions. In case of underdeviation the signal-to-noise ratio will become poorer due to the signal approaching the intrinsic or inherent noise of the system. Injection levels become more critical on longer systems or systems with a large number of channels.

Example. In a one hop system, a 10 percent deviation in baseband levels

results in an error of one DB. This is negligible. However, in a five hop system, with each 10 percent down, the resultant system gain would be $(0.9)^5$ or 59 percent. This would be a noticeable discrepancy. Assuming the levels are only 10 percent high through each of five hops, the resultant system gain would be $(1.1)^5$ or 61 percent. Sixty-one percent over deviation would tend to degrade even a medium loaded system quite noticeably.

For routine checks a pilot or reference channel should be selected so system levels can be measured at any point throughout the entire system. A regulating or synchronizing frequency used on the system is convenient. Another means is to select one of the multiplex channels for a pilot. However there are certain factors to remember when selecting a pilot. It is not advisable to use a party line voice channel because of the "hybrid effect" which may cause many irregularities in level measurements. A channel carrying either frequency-shift telegraph or telemetering tones is a good selection with single side band multiplex as modulation can always be measured. If a telephone trunk channel is used, it may be necessary to remove it from service each time measurements are to be made.

When the maintenance of the carrier and multiplexing equipment is handled by a separate crew or department, other than the microwave maintenance personnel, it is desirable to arrange for checking the levels over both equipments at the same time. This may deviate somewhat from typical operations, but will eliminate a return trip should a discrepancy occur.

Test equipment. The selection of test equipment for a system requires considerable study. What is adequate for one system may be insufficient for a similar system in a different location. What about the availability of spare units? Would it be more practical and economical to repair the IF amplifiers in the field or to return them for factory servicing? Are there adequate personnel for making the repairs? On the average long haul, high density microwave systems of today, an investment of $10,000 in test equipment per maintenance man would be profitable and worthwhile. Insufficient test equipment can only lead to needless hours of system outages and increased man hours of maintenance time.

Table 2 shows general requirements of the most common types of test instruments used on the typical microwave system and gives a brief description of the uses of these instruments.

Table 2

Instruments	Min. Requirements (Typical System)
AC Vacuum Tube Voltmeter	Sensitivity—0.1 mv to 300V Response—10 cps to 4 mc Scales—DBM and Voltage
Oscilloscope	Sensitivity—0.01 V/CM to 50 V/CM Response—DC to 4 mc
Selective AC Voltmeter	Sensitivity—minus 70 to plus 40 DBM Selectivity—plus or minus 250 cps Freq. Range—Cover system requirements
Wide Range Oscillator	Freq. Range—50 cps to 60kc Min. output—3 V into 600 ohms
Panoramic Analyzer	Amplitude and Frequency Markers Response adequate for system requirements
Carrier Frequency Generator	Freq. Range—10 cps to 10 mc Min. output—3 V into 600 ohms

When ordering new and replacement instruments, special attention should be given the new transistorized light weight units now becoming available. Not all microwave installations are easily accessible with adequate provisions for servicing. For example, a transistorized AC voltmeter with a self-contained power source proves quite an aid when the microwave equipment is located in a barely accessible place or on an off shore platform.

An accurate AC-Vacuum-tube volt meter is perhaps the most important single item of test equipment on any communication system. It can be used for measuring *audio, video, subcarriers, ripple, carrier leak* and *noise levels.* This instrument must be a highly dependable and accurate piece of equipment which is to be the standard for the entire system and other test equipment.

The oscilloscope is also useful for measuring *power supply ripple, carrier leak and noise levels.* It can also give *waveform analysis, pulse width, amplitude, repetition and rise time checks.* The oscilloscope has an advantage over many other instruments in enabling the operator to see exactly what he is measuring. This is quite important in trouble shooting noise and distortion problems. The oscilloscope is becoming ever more important with transistorized circuitry. The scope allows dynamic testing of units without ill effects on delicate circuitry by application of current or loading.

The use of a frequency selective voltmeter (wave analyzer) simplifies the most difficult level problems in multi-channel single sideband systems. This unit allows measurements of the level of any carrier or subcarrier at any point on the system without disrupting any circuits. It is also used for measuring harmonic and intermodulation products. On all multi-channel single sideband systems there should be a selective voltmeter for each maintenance man's use.

The panoramic analyzer has the same general use as the selective voltmeter. Its main difference is that it enables one to look at a wide group of channels simultaneously. The use of this instrument is ideal for FM and other multiplexing systems using wide subcarrier spacing.

The wide range oscillator is quite useful for routine level settings and audio response checks. An oscillator with a frequency range covering the subcarrier frequencies of the multiplexing equipment is useful for simulating carriers for local trouble shooting and for limited frequency response measurements on the microwave baseband.

The carrier frequency generator is a more versatile version of the wide range oscillator. This unit should be capable of simulating any carrier of a high-density system. This enables the maintenance man to make frequency response measurements over the entire microwave baseband.

If there is an indication of weak signals into a receiver, a UHF or SHF test set can be used to analyze the problem. With a test set operating in the frequency band one will be able to measure the transmitted power and received power at the microwave frequencies. The net path loss will then be the difference between these readings. If the transmitter power is low, the problem has been localized. If the path loss is greater than normal, the antenna system may be at fault. If one still has problems and has insured normal received power, the test set can be used for measuring the carrier to noise ratio of the receiver. With long microwave systems the uses of this instrument proves an invaluable aid for localizing faults in the antenna system, transmitter, receiver or path.

Regulated power sources. The operation of an electronic regulated power supply differs from the conven-

tional supply. Usually it is equipped with a series regulator device and a constant current or constant voltage reference. To give a high degree of regulation, an amplifier is used to magnify the difference or error signal to approach instantaneous and near perfect output level. The three most common regulated power supplies in use today are the vacuum tube, transistor and magnetic amplifier controlled types.

A failure of the reference source or feedback source in any of these types will cause the output voltage to rise to its maximum capabilities. When a VR tube is used for a reference, the glow will be absent. When a zenar diode or thyrite reference is used, voltage measurements will be necessary to analyze the problem. With VR tubes, an unusual but, not too uncommon fault is for the tube to ionize at two slightly different potentials. The voltage difference across the reference can hardly be measured; yet, there will be an appreciable difference at the output. This condition can be observed by noticing a flicker or abrupt change in the glow. A faulty VR tube will generally be the problem and should be replaced.

An excessive rate of failure of the series regulator can be traced to two items: (1) excessive load on the supply, and (2) too high supply line voltage. For prolonged tube life, try to keep the line voltage within the nominal value 0 percent minus 10 percent. When a paralleled tube fails in the series regulator, replace all of them. Do not parallel a weak and new tube together.

Excessive ripple voltage. Measure the DC and ripple voltages at the input to the series regulator on a routine basis. Excessive ripple at this point is characteristic of a weakening diode in a full wave rectification circuit or possibly a faulty filter component. Low DC voltage at this point shows weakening rectifiers or improper line voltage.

The results of a weak difference amplifier are: increased output voltage and high ripple and poor regulation. A weak series regulator will also result in poorer regulation and possibly reduced output voltage. Audio frequency oscillations in the vacuum tube types is often an indication of a faulty VR tube or series regulator. Routine measurements at the output of the supplies will locate these discrepancies. If the gain in a difference amplifier circuit is suspected of being low, the amplification of this circuit can be checked by using a high gain oscilloscope to measure the relative gain of the ripple voltage. If scope gain or ripple voltage is insufficient, inject a signal from a test oscillator for tracing through the circuitry.

The previous paragraphs pertain mainly to the vacuum tube and transistor type supplies. Because the magnetic amplifier type operates on the principle of current feedback through a saturable reactor for limiting the output voltage, a different approach for routine maintenance is used. Most of the regulating elements are transformers which rarely need replacing. Aging of components will necessitate periodic readjustments. Routine checks for preventive maintenance include operational tests and observing for a stable reference source and the conditions of the rectifiers.

Antenna system. Since the antenna system is comprised of passive elements, there is a natural tendency for neglecting the required maintenance. Maintenance and inspection of antennas and towers is highly important, however.

Parabolic antenna must be kept free of dust, spider webs and foreign materials, especially on the feed. The mounting hardware must keep the antenna from excessive vibration and be free from rust.

Long coaxial and waveguide transmission lines should be maintained under pressure to insure freedom from moisture. (Never use over five pounds pressure on a waveguide run where the pressure will be transferred to the windows on the antenna feed.) For pressurizing a transmission line, a dry air pump or a tank of oil-pumped nitrogen is generally used. Water-pumped nitrogen is not recommended. A pressure gauge and a shut-off valve on each line will prove to be quite useful for localizing a fault should a leak occur.

Whenever the transmission line is opened for repairs or inspection, it is a good practice to moisten the 'O' ring gasket with silicon grease before replacing the flanges. This will give more positive assurance against leaks at the flanges.

Antenna heaters. Make sure the antenna heaters are operating properly. A sticking thermostat can cause a large waste in power consumption, or a serious system outage. Check each individual heating element to be sure that none is burned out on the parabola and feed.

The towers should have a thorough inspection prior to the stormy season. Check the anchors to see if they are pulling out of the ground. Check the base for tilting or settling. Loose guy lines may be a quick indication of one of these faults. Check for loose or missing bolts which may have vibrated loose and replace or tighten as necessary. Brush rust from guys and hardware. Use primer and paint to protect from further damage. Check the guys for broken or missing strands.

Check guy tension with a dynamometer and adjust to the manufacturer's recommendations. Check for tower plumb by aligning a transit at two positions at right angles. If the tower is out of plumb it should be corrected by someone experienced in tower erection. As soon as possible after any severe storm, the tower should be rechecked for possible damage.

Check antenna and reflector alignment every two years, more often if tower alignment or shifting is suspected.

One popular method used for reducing the costly task of changing burned out tower lamps is to replace all bulbs every six months.

Make routine station visits really count. Gather all important data showing the performance of each unit. Never allow a unit to deteriorate to the point where a service call will be necessary. —**The End**

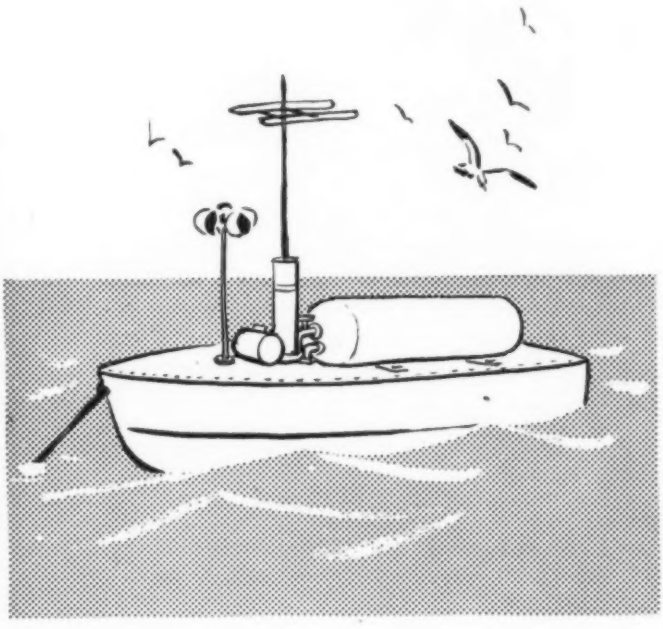
About the Author

Harold E. Smith has been with Motorola for three years. Prior to his present position as a components and reliability engineer, he spent three years as a microwave field engineer and two years as a systems engineer. He has had 11 years experience with communications and radar systems. Smith is a member of the Institute of Radio Engineers. He was graduated from the Electronic Technology and Design Course at DeVry in Chicago.

Pipe Line Pete's

IDEAS FOR THE FUTURE!

By Donald M. Taylor, Engineering Editor, Pipe Line Industry



Thermoelectric Generator For Use on Offshore Station

General Instrument Corp. has been awarded a contract by the National Bureau of Standards to design and fabricate a propane-fueled thermoelectric generator system as a possible power source for the Navy's unmanned ocean-based automatic weather station now beaming back vital weather information from 300 miles out in the Gulf of Mexico.

The unit will operate in conjunction with a nickel-cadmium battery, and it will deliver a peak current of 30 amps, 12 volts when needed. The fuel will be propane and 225 gallons will be sufficient to operate the unit for one year. The burner will be flameless—one which oxidizes the gas, thereby eliminating burner fouling. Its heat will cause semiconductor thermopiles to produce the current.

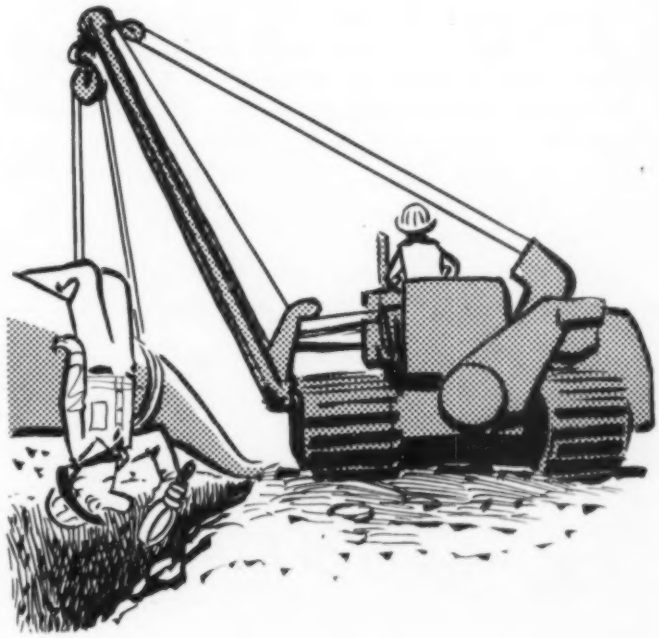
Geobotany May be Road to Riches for Pipeliners

Not many pipeliners get rich pipelining, but there's hope that some of them will if they cultivate *geobotany* as a hobby. As the word suggests, this is a combination of *geology* and *botany,* and according to recent issue of *Science* magazine, this may furnish clues to valuable underground mineral deposits.

Abnormalities in plants can be associated with certain minerals in the ground. For example, some mustards and pinks indicate the presence of zinc.

Too, it should be pointed out that geologists have made discoveries from time to time by following the ditching machine and observing earth structures in the ditch.

Thus, the pattern for the young man desirous of wealth becomes clear: Study geology—learn all that's possible about geobotany (cultivate an eye for the flora and the fauna) and then take up welding or ditching machine operating. As an added measure, he might manage to marry a rich girl.



Interesting New Developments in the Electronics Field

Infrared Radio

You can carry on a conversation for a distance of some 500 yards using phones which convert sounds into infrared beams for transmission between points. The units are quite similar to walkie talkies—but instead of radio waves they use the heat waves.

This is no idle dream. The cost of two transmitters and two receivers is only $39.95. Power requirements are two flashlight batteries per unit. The developer of the new idea is Infrared Industries, Inc., of Waltham, Mass.

Electronic Scanner

One of the big bottlenecks in the computer field is the key punch operators needed to manually translate figures into digestible fare for the high speed computers. Intelligent Machines Research and International Business Machines Corp. have developed a new scanner which can do the work of 150 key punch operators. It can scan 20,000 numbers per minute!

Spark Pump For Ignition

The pickup element on your record player works on the principle of piezoelectricity:—certain crystals such as quartz will produce electricity when twisted. Using this phenomenon, Clevite Corp. of Cleveland has developed a spark pump made of two ceramic parts that convert a short motion into a 20,000-volt discharge, according to a recent issue of *The Wall Street Journal.* This is about double the voltage of most engine generators or magnetos.

The company is exploring the many possible uses of the new development. Gas engine ignition may offer one possibility; power lawn mowers, another.

Advances in Turbines, Epoxies, and Hydrogen Blistering

825 HP Gas Turbine

Trunkline Gas Company is station testing an 825 hp General Electric gas-fired turbine that weighs only 320 pounds! The unit will be run experimentally for one year at Trunkline's Cypress, Texas, compressor station near Houston.

Two men can lift the unit and it can be hauled about in a station wagon!

Gosh! About 10 years ago, I had charge of setting some 1,000 hp engines for a compressor station. One of the major feats in the operation was moving them from the railroad siding to the jobsite. Seems like it took a specially built truck, special permits and all our equipment within a 100 mile radius to do the job!

Soon we'll have compressor buildings about the size of dog house—or maybe they'll be just a slight bulge in the pipe line.

Epoxy Bonds Concrete

The California Division of Highways reports that concrete joints composed of aged concrete and fresh concrete will show no cracking if the old concrete is coated with epoxy resin before the free concrete is poured. The Highway Department is using this method to repair holes in concrete roads.

This should prove useful at pipe line compressor and pump stations.

New Theory for Hydrogen Embrittlement

Atomic hydrogen will combine with graphite at room temperatures to form hydrocarbons such as methane, acetylene and paraffins according to researchers Dr. Henry Wise, Dr. A. B. King and Dr. S. H. Inami at Stanford Research Institute in Menlo Park, California.

This may explain hydrogen blistering and embrittlement which occurs in pipe lines, say the scientists.

In their experiments, they found that atomic hydrogen —produced by radio waves discharging into test tubes of hydrogen—would combine with carbon at ordinary room temperatures to form hydrocarbons. This led to the theory that hydrogen atoms in pipe lines are small enough to enter the interstitial spaces in the walls of the steel pipe, may be combining with the carbon in the steel to produce embrittlement, and then, because the hydrocarbon molecules are too large to escape out of the interstitial spaces, blistering may occur.

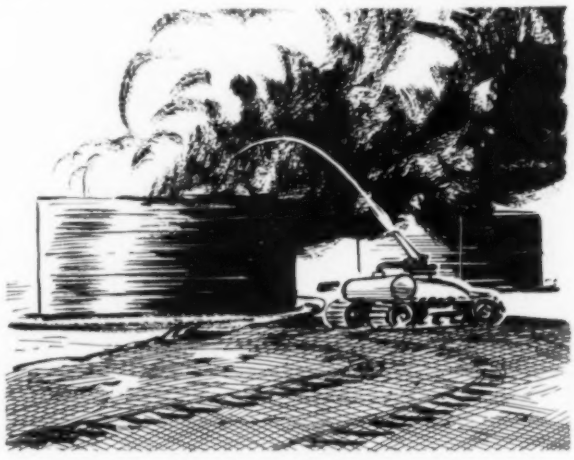
The novel aspect of this experimental work is that the reaction will take place at pipe line operating temperatures.

It has been generally accepted for some time that this is a cause of embrittlement at high temperatures.

Watch For New Techniques Fighting Fire and Welding

Robot Fire Extinguisher

Hughes Aircraft Company petitioned the FCC for allocation of 100 megacycles within the 13,000-35,000 mc band for radio controlled robots which could be used for fighting forest fires, petroleum fires and for performing other tasks dangerous to human beings. Hughes has been working on a mobile robot ("Mobot") that can be remotely controlled to do such hazardous jobs.



Ultrasonic Welding for Aluminum Foil

The Aluminum Company of America has developed an ultrasonic welding technique which has proved highly successful in welding aluminum foil. The frequency of the vibrations used are far above the range of human hearing, and the part they play in the joining of the metals is to rupture the natural aluminum oxide coating on the foil. Once this impurity has been dispersed, the metal forms a true metallurgical bond across the entire width of the juncture. The bond is essentially as strong as the parent metal.

New Rod to Weld Cast Iron

A new electrode permits cast iron welding in a fraction of the time formerly required. Developed by Eutectic Welding Alloys Corp., the process leaves a deposit that does not need cooling before the second pass is applied. What's more, the weld can be quenched without breakage.

Rules of Thumb

and Engineering Data Sheets for the Pipeliner's field notebook

$25 for Engineering Data Sheet $15 for Rule of Thumb

These practical aids give quick, reasonably accurate answers to design, maintenance and cost estimating problems. PIPE LINE INDUSTRY will pay $25 for each chart, nomograph or data sheet published—$15 for each Rule of Thumb. Send your ideas to PIPE LINE INDUSTRY, P. O. Box 2608, Houston, Texas

Pipe Line Construction —22—When Should Steel Be Pre-Heated Before Welding

From the chemistry of the steel determine the carbon equivalent which is—

$$\text{Carbon Equivalent} = C + \frac{Mn}{4}$$

If it exceeds 0.58 the steel may be crack sensitive and should be preheated before welding in ambient temperatures below 40° F.

Example: If steel pipe having a carbon content of 0.25 and manganese content of 0.70 is to be welded in springtime temperatures, ranging from 40° F to 80° F, is preheat necessary?

$$\text{Carbon Equivalent} = .25 + \frac{.70}{4} = .25 + .175 = 0.425$$

It is not necessary to preheat this particular steel before welding it.

But for Another example:

Carbon = 0.20

Manganese = 1.60

Carbon Equivalent = .20 + .40 = 0.60

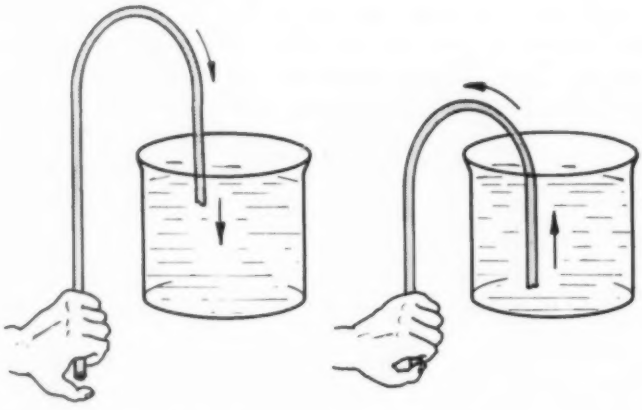
This steel should be preheated, particularly for early morning welding.

Why does preheating prevent cracking? It slows the cooling rate and reduces the amount of austenite retained as the weld cools. This prevents microcracking. Other alloying elements and pipe wall thickness may also influence just when joints of high strength pipe should be preheated.

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas



How to Make a Pump From An Ordinary Piece of Hose

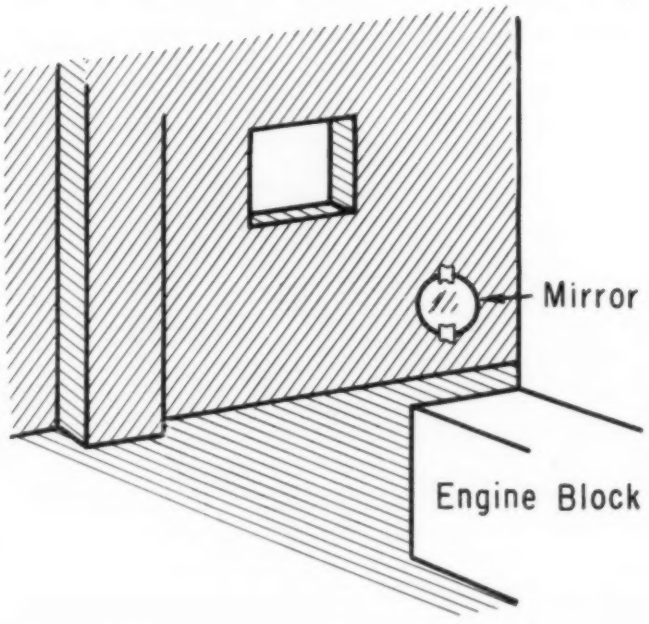
Ever suck on the end of a rubber hose to start a syphon?

Chances are you have and at the time you probably worried about the poisonous lead and noxious hydrocarbons in the gasoline.

In any event, you can get rid of those worries—there is a better way to fill a syphon hose. Here's the way it works:

Place one end of the hose in the gasoline; plunge it up and down rapidly in the fluid, making a six or eight-inch stroke if possible. Hold the other end of the hose below the level of the gasoline and place your thumb over this end each time you make the up-stroke on the hose in the tank.

The time required to fill an 8-foot length of garden hose to start a syphon is less than half a minute.

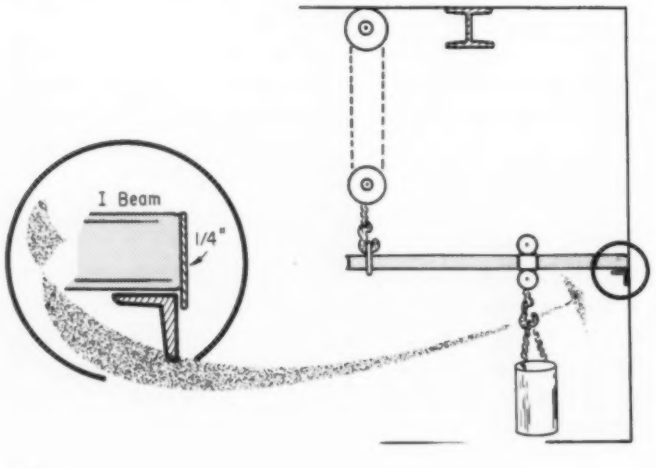


Use Mirror to Discover Where Moisture Comes From

Compressor buildings with basements in the southern regions of the U.S. bring the problem of excluding moisture from the piping, heat exchangers, oil reclaimers, etc., stored there. How is the best way to determine whether or not moisture which may be found is coming from seepage or condensation? Here is a simple test:

Carefully dry off a small mirror. Tape it to the wall in one of the moist zones. If condensation is occurring, the mirror will become wet. If it's seepage it will usually remain dry.

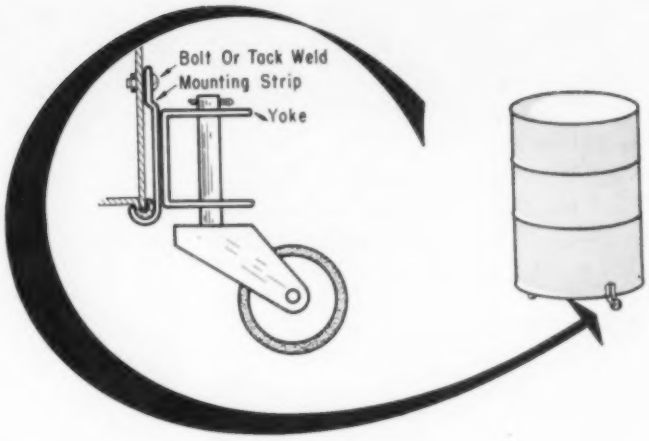
Use Trolley to Move Heavy Loads into Compressor Building



Sometimes it is impossible to pick up heavy machine parts near the sides of the compressor or pump building with the overhead traveling crane without damaging the building floor. Here is a rig-up which will solve this problem. The idea is to use a length of pipe or structural steel as a track and run a trolley over it to carry the load to a point where it can be picked up by the chain hoist on the traveling crane.

Where an operation such as this is repetitive, the trolley should be fabricated with care and a roller with bearings and a concave configuration to fit the pipe or structural steel should be used. As a temporary expedient however, a slide made of steel plate will traverse the span if it is well greased. Size of the various members will depend on the load to be lifted.

Place Casters on Drum For a Mobile Trash Can



Here's a simple way to mount casters on a used oil drum to make a highly mobile trash can for the station or warehouse.

A mounting strip of light-gage strap is bent as shown and welded to the yoke on casters. The amount of offset in the mounting strip is equal to the thickness of the crimped bottom of the drum. The mounting strips are tack-welded or bolted to the drum.

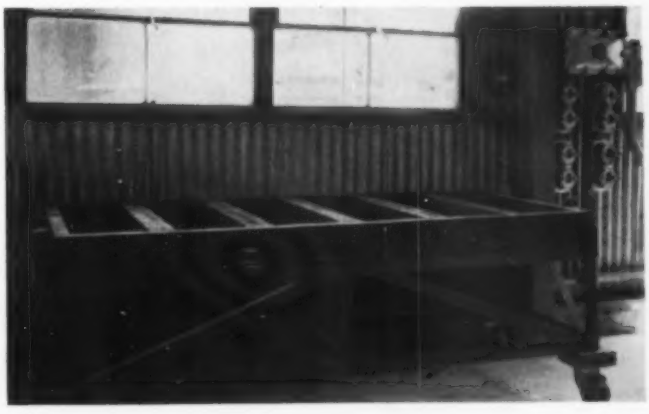
These Rules Will Help Keep Fuel Free of Water

To everyone comes the time when the automobile, the tractor, the truck or the power lawn mower won't run because water is in the fuel system! Here are some simple rules that will help you avoid this inconvenience in the future:

1. Look for water in drums or tanks. Sounds simple, but you will be amazed how many times you will find water in storage tanks.
2. Where a 55-gallon drum is stored outside, keep it in horizontal position. This keeps snow and water from collecting on top and causing condensation inside.
3. Keep a full tank on your automobile or tractor, etc. Most condensation occurs when the tank breathes damp air in at night. The more space, the bigger "breath."
4. Drain your water traps. Once they are full, they will pass water on to engine.
5. Keep bowls clean—you can see through the glass and judge whether or not water is present.
6. Add traps where they are needed.
7. Add alcohol where small amounts of water are in gasoline. This will help you consume the water in the engine.
8. Place a can or cover over the exhaust stacks at night. The reason is obvious.

Some of these rules may seem trite. But the water-in-the-fuel problem is a simple one, yet vital, especially on cold days.

Servicing Dolly Handles Compressor Engine Parts



Here's a tough servicing dolly which will handle practically any compressor engine part during repairs and maintenance operations.

The height is measured to provide maximum convenience; the heavy angle iron framework and casters are sized to support such engine parts as connecting rods, cylinder liners, pistons etc. The top of the unit is made of 2 x 6-oak timbers doubled where used as cross members to give the dolly strength. The gap between the cross members will allow a piston rod to go through and the piston remains upright with the skirt resting on the oak.

The wooden bed is removable, and when a crankshaft is to be repaired, the bed is removed, and the shaft supported in two U-shaped carriers at either end.

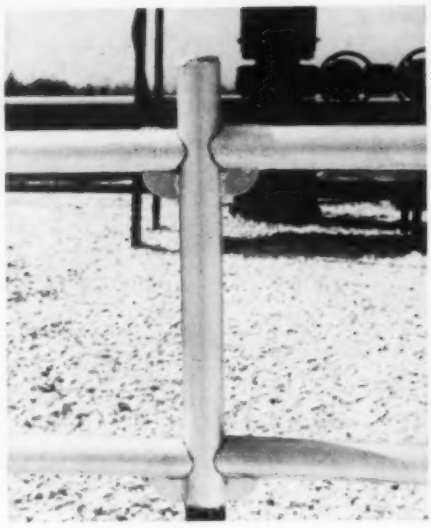


FIGURE 1

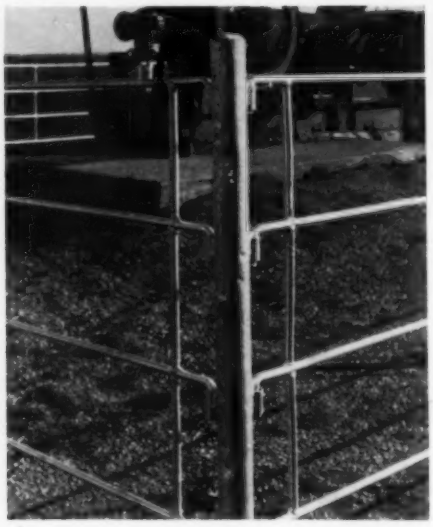


FIGURE 2

Make Removable Fence From Scrap Pipe

Here are three different types of fences that can be used to protect field pumps and equipment. All three types can be constructed from scrap materials. A minimum of welding time also is required for a sturdy installation.

Figure 1 shows a removable well fence constructed entirely of junk 2-inch line pipe. As shown, the vertical member is provided with four L-shaped pieces of steel at the top and bottom. The horizontal members are provided with matching slots for the L-shaped pieces of steel on the post. The fence post is set in concrete. To remove the fence, the horizontal sections are simply lifted upwards and disengaged from the L-shaped pins welded to the post. The entire fence can be removed in a matter of minutes.

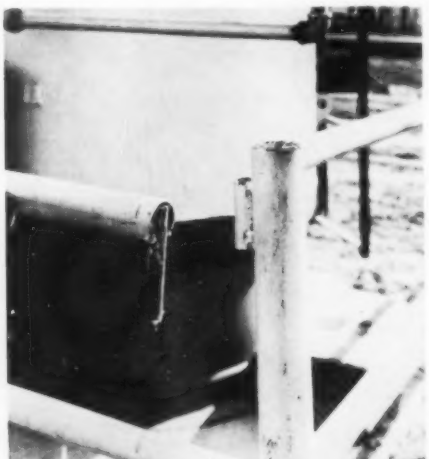


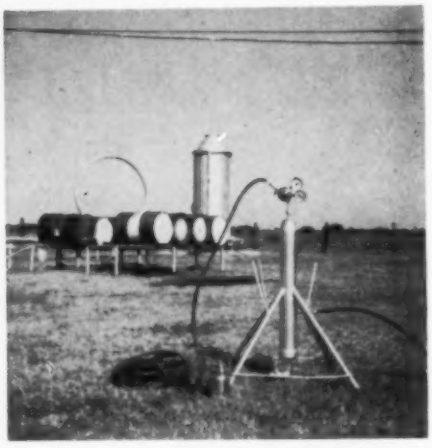
FIGURE 3

A quantity of junk sucker rods has been used to construct the well fence illustrated in Figure 2. Three vertical lengths of rod are welded next to each end of the horizontal fence section to provide rigidity The ends of the rods are bent at a 90-degree angle to engage pipe collars which have been welded onto the 2-inch pipe used as corner posts. Size of these collars depends upon the size of rods used for the fence sections. An upward movement again completely disengages the horizontal fence sections and facilitates immediate removal.

A third type of removable fence is shown in Figure 3. This method uses junk 2-inch pipe and a short section of steel rod as its main components. The rod is welded to the end of the horizontal fence member at a 90-degree angle. A piece of small pipe of the correct diameter to receive the sucker rod is then welded lengthwise to the vertical fence post. Again, the entire fence can be removed in a matter of minutes by lifting upwards and disengaging the sucker rod portion of the horizontal members from the small pipe receivers.

Use Portable Drip To Supply Spray Gun

This portable scrubber is used to supply gas to paint spray guns and pressure type cleaners. The drip is made of junk 3-inch pipe with welded caps on each end. One-fourth inch outlet and ¼-inch inlet connections are provided as shown. A pressure reducing regulator is installed on the outlet connection. A ½-inch drain is installed in the bottom. Legs are constructed of one-inch pipe with ¼-inch rods attached vertically. These



¼-inch rods are used as guides for the spray gun hose. When moving, the hose is coiled around the drip with the guides, thus enabling one man to load, move and unload the unit easily.

Sump Around Tank Makes for Neat Battery

This operator has constructed a narrow sump around the circumference of each stock tank in the battery. Scrap tank steel is cut and bolted as shown. Gravel then is used to fill the space between the steel and the tank. Oil dripping from the gage glass or spilled from the tank is retained in the sump and the lease is kept clean at all times.

WHAT'S HAPPENING IN PIPE LINE CONSTRUCTION

By Donald G. DePugh, Construction Editor

Texas Eastern Submits Bid to Build 1,050-Mile Gas Pipe Line in Argentina

Texas Eastern Transmission Corporation has submitted a bid to the Argentine state gas agency, Gas del Estado, to build and operate one of the world's largest gas pipe line systems.

One of three companies to bid on the $380 million project, Texas Eastern proposes to design, construct and operate a 1,050-mile, 30-inch line from Comodoro Rivadavia to Buenos Aires, Argentina.

An Argentine company and an Italian firm, ENI, also submitted bids early in November. Gas del Estado is scheduled to announce in February which company will handle the huge transmission system. It will be the second major gas transmission line in Argentina. A 1,100-mile, 22-24-inch line from Campo Duran to Buenos Aires was completed this year by the International Pipeline Constructors, S.A. for Yacimientos Petroliferos Fiscales.

Texas Eastern has formed a subsidiary company, Gasodar, S.A., to build the line. It will be owned 50 percent by Argentine interests. Financing of the line will be a unique venture in itself. Part of the money will be raised by Argentine owners and a portion would come from the Export-Import Bank and Development Loan Fund, both United States Government organizations.

If it is the successful bidder, Texas Eastern plans to begin work on the line as soon as finances are worked out—probably sometime in 1961.

Houston Contracting Company Working on Several Projects

Houston Contracting Company has been awarded contracts by Seadrift Pipeline Corporation, Natural Gas Pipeline Company, and Texas Gas Transmission Corporation.

Houston is laying 27 miles of 6-inch for Seadrift between Baytown and Texas City, Texas. NGPL let contract on 17 miles of 8-inch and 10 miles of 6-inch in the vicinity of Rockport, Texas. Houston has 1.5 miles of 16-inch gas line near Morgan City and 12 miles of 6-inch products line near Lake Charles for Texas Gas.

Willett Awarded Contracts For Stringing Transco Work

J. O. Willett Pipe Line Stringing Corp. has been awarded a contract to load, haul and string approximately 90 miles of 36-inch pipe in loops in Alabama and Georgia for Sharman, Allen, Gay, & Taylor, Inc.

Willett also is stringing about 45 miles of 30-inch in Louisiana and Texas for Houston Contracting Company. Both jobs are for Transcontinental Gas Pipe Line Corporation's looping project. On a short section near Houston, Willett has subcontracted stringing to Petroleum Helicopter, Inc. Helicopters are being used to string pipe in muddy areas.

Seadrift Lets Contract To Vickers and H&K

Seadrift Pipeline Company has awarded a contract to H & K Construction and Roy Vickers Co. in a joint venture for 80 miles of dual 6-inch LPG line.

The line starts at Markham and extends to Baytown. Seadrift also let contract to Houston Contracting Co. for 27 miles between Baytown and Texas City, Texas.

FPC Sets New Hearing On TGT Import Case

The Federal Power Commission has reopened proceedings on Tennessee Gas Transmission Company's application for importing gas from Canada on an interruptible basis near Niagara Falls, N. Y.

Hearings will commence December 19. The FPC earlier denied TGT the permit on this project and Tennessee Gas filed exceptions to the decision requesting that proceedings be reopened for the purpose of submitting specified, additional evidence.

Tennessee Gas Granted Temporary Authorization

Tennessee Gas Pipeline Company was granted temporary authorization to construct 50 miles of 10-16-inch gathering lines to take gas from Delta Block 30, South Timbalier Block 54, Bay Marchand Block 30, and Caillou Island fields, offshore Louisiana.

Reserves made available through this project would be about 341 billion cubic feet. Cost is estimated at $4.5 million.

Pan American Plans 50-Mile, 12-Inch System

Pan American Gas Company is planning a 50-mile, 12-inch gas pipe line system that will extend from the Houston area to Texas City, where it will connect with Pan America's main line that runs from South of Texas City to Orange, Texas.

The line will take gas from La Porte, Texas and deliver to Pasadena near Houston and Texas City. Brown & Root, Inc. is prime contractor.

FPC Natural Gas Maps Available

The Federal Power Commission has issued its latest "Major Natural Gas Pipelines" map which is current through June 30, 1960. The new map supersedes the December 31, 1960 edition. The map shows major existing pipe lines, lines under construction or authorized but not yet started, and proposed lines pending commission action. Copies of the map may be obtained from the Federal Power Commission, Washington 25, D. C. at 25 cents each.

Texas Gas Files $16.8 Million Expansion Proposal with Federal Power Commission

Texas Gas Transmission Corporation has filed an application with the Federal Power Commission seeking permission for construction of 146 miles of loops and extension lines up to 30 inches in diameter.

The project includes 96 miles of 26-30-inch loops in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky and Indiana and 50 miles of lines extending into producing areas of Louisiana. Also Texas Eastern will add 2,000 hp at Lafayette, La. station and 2,000 hp at its West Greenville storage field compressor station in Kentucky.

The 30-inch loops will be between Slaughters and Fulton, Ky., Friendship and Memphis, Tenn., Lake Cormorant and Clarksdale, Miss., and Bastrop and Monroe, La. Loops near Hardinsburg, Ky., and Eunice and Lafayette, La., will be 26-inch. An 8-mile, 6-inch loop is planned near Greencastle, Ind. All other construction would be in the Gulf Coast area in Louisiana, including a 50-mile, 8-16-inch line connecting the system with five producing fields in Terrebonne Parish.

The $16.8 million expansion program would make available an additional 50 MMcf of gas daily to Texas Gas customers in Arkansas, Mississippi, Tennessee, Kentucky, Illinois, Indiana and Ohio.

Products Line Approved By Portuguese Government

R. W. Rowland has been granted a permit by the Portuguese government for construction of a products pipe line from Beira, Mozambique, to Rhodesian border, scheduled for 1962 completion. The $16.8 million project may be extended to Salisbury if permission is granted by the Rhodesian federal and southern government.

Navy Building Jet Fuel 96-Mile, 6-Inch Line

William Lyles Co. has awarded a contract to Alex Robertson Company to lay a 96-mile, 6-inch jet fuel pipe line for the United States Navy. The line will extend from the Naval Air Station Lemoore to Estero Bay, California.

Oasis Seeks Permit to Lay 30-Inch Crude Line

The Oasis Group of oil companies is awaiting the decision of the Libyan Petroleum Commission on its proposed 86-mile, 30-inch crude line in Libya. Oasis is comprised of Amerada, Continental and Ohio Oil and plans a 300,000 barrel per day pipe line from the Dahra area to Es Sider on the Gulf of Sirte. Seven storage tanks with 313,000 barrel capacity will be built at the Es Sider. There will be a 42-inch feeder line and 36-inch submarine line extending one-mile offshore to tanker loading berths.

Also 36 miles of 20-inch line will be laid from the Mabruk area to a junction point between Dahra and Es Sider.

Munich to Venice Line Proposed by J. Paul Getty

Another proposal to construct a crude line from Munich to Venice has been made by J. Paul Getty. His plans call for a 350-mile Trans-Alpine system costing $47.6 million.

Coal Line From Ruhr To Bavaria Considered

Plans for a coal pipe line from the Ruhr to Regensburg in Bavaria are being considered by a group of companies. These include the public relations organization of the Ruhr coal sales group, the technical association of the German coal industry (Steinkohlenbergbauverein) and the Company for Hydraulic Transport (Gesellschaft fuer Hydraulischen Transport).

Consolidation Coal Co., Pittsburgh, which operates a coal line, would participate in the venture. The line would be designed on the lines of Consolidation's system. The line is still in the idea stage, with no development on financing, construction, terminals, etc.

Qatar Petroleum Plans 60-Mile Gas Pipe Line

A 60-mile gas pipe line system will be built by Qatar Petroleum Company from near Dukham to Doha Qatar. The system will consist of 50 miles of 10-inch and 10 miles of 6-inch. Pencol Pipeline & Engineering Consultants has been awarded the contract as engineering consultants and designers of the system.

The project is scheduled for completion in 1961.

Techint Building Pipe Line in Syria

Techint, a company composed of several private firms will construct a products pipe line to link the refinery at Homs, Syria to the distribution from Alex, Damas, and Laodicia. The 6-inch line will cost $7 million.

Another line is planned in northeast Syria to the port of Laodicia—a 440-mile, 12-inch line.

Mid-American Pipeline Co. Completes Line Construction

Construction has been completed on Mid-America Pipeline Company's 2,200-mile LPG system stretching from Texas-New Mexico to terminals in Wisconsin and Minnesota.

Propane will now be accepted through all seven of the company's terminals.

Sahara Gas Condensate Line Planned

SN Repal plans a gas condensate pipe line to extend from the Hassi R'Mel gas field to the field terminal of the Hassi Messaoud to Bougie crude line completed last year in Algeria.

A natural gas line is being constructed from Hassi R'Mel to the Mediterranean. The condensate line will be about 180 miles and 8 inches in diameter. The line is expected to be completed in 1961; pipe already has been ordered for the line.

Estimates of the gasoline-kerosine-gas oil mixture which will be condensed from the gas field set the capacity in 1961 at about 40,000 metric tons.

PROPOSED PIPE LINE CONSTRUCTION

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

U.S.

Algonquin Gas Transmission Co., Boston, 25 miles, 20-inch; 8 miles, 8-inch, gas, and 12,000 hp addition in Massachusetts, $6 million, before FPC.

Arkansas Louisiana Gas Company, Shreveport, La., 58 miles, 2-6-inch, gas, planned.

Belle Fourche Pipeline Co., Casper, Wyo., 103 miles, 8-inch, crude, Fiddler Creek field to Lance Creek, Wyo., and branch lines from North Donkey Creek field to Rozet and Miller Creek fields, $2¾ million, approved by Wyoming Public Service Commission.

Border Gas Transmission Company, 300 to 400 miles, gas, gathering, in south Texas, $10 million, planned.

Buckeye Pipe Line Co., New York, 54 miles, 16-22-inch, crude, main lines from Toledo to Samaria, and Detroit, Mich., $4 million, contract let on 41 miles of 16- and 22-inch to **Panama Williams Corp.** and **Somerville Construction Co.**

Carolina Pipeline Company, Columbia, S. C., 85 miles, 8-inch, gas, in South Carolina, $5 million, before FPC.

Coastal States Gas Producing Co., Corpus Christi, Texas, 60 miles, 10-inch, gas, gathering, La Salle and Frio counties, Texas, before FPC.

60 miles, small diameter, gas gathering line, to tie in with system under construction and extend to Pearsall County, Texas, planned.

25 miles, gas, Associated Gas & Oil Co. field to South-Tex Corp., processing plant west of Corpus Christi, Texas, planned.

37 miles, gas gathering in Brown, Eastland, Comanche and Erath counties, Texas, planned.

Coastal Transmission Corp., Houston, 81 miles, 3 to 10-inch, gas, laterals; 5,500 hp in stations at Port Lavaca, Texas, and Eunice, La., and additional 1,500 hp at Robstown, Texas, $6.2 million, before FPC.

Colorado Interstate Gas Co., Colorado Springs, 140 miles, 34-inch, gas, Green River, Wyo.,-to-Provo, Utah; 109 miles, 26-inch, Texas Panhandle to southeastern Colo., 136 miles, 34-inch, southeastern Colorado-to-Pueblo, Colo.; 107 miles, 30-inch, Pueblo-to-Denver, $91 million, FPC examiner approval.

Colorado Oil & Gas Corp., Denver, 400-miles, gas, from Gubik field to Fairbanks, Alaska, planned.

East Coast Pipeline Co., 90 miles, 12- to 24-inch, products, Linden, N. J. to Suffolk County, N. Y., $25 million, planned.

El Paso Gas Supply Company, El Paso, Texas, 228 miles, 30-inch, gas, main, Live Oak to Sutton County, Texas, $30 million, planned.

El Paso Natural Gas Company, El Paso, 199 miles, 30-inch, Permian-San Juan crossover loop, before FPC.

17 miles, from Pacific Gas Transmission Co. facilities to near Spokane, Wash., before FPC.

34 miles, 20-inch, Puckett to Goldsmith, before FPC.

23 miles, 20-inch, Goldsmith to Eunice-Plains line, before FPC.

9 miles, 20-inch, Goldsmith-Plains loop, before FPC.

43,600 hp in new and existing stations in Texas, Oklahoma, New Mexico and Utah, before FPC.

400 miles, 34-inch, Salt Lake City, Utah, to California border, FPC examiner approval.

El Paso Natural Gas Products Company and **El Paso Products Pipeline Co.,** 32 miles, 6-inch, crude, from Patrick Draw Oil and Gas Field to Wamsutter, Sweetwater County, Wyoming, before Public Service Commission.

Equitable Gas Company, Pittsburgh, Pa., 31 miles, 16-inch, and 26 miles, 20-inch, in West Virginia and Pennsylvania, $5 million, before FPC.

Great Northern Railway, St. Paul., 110 miles, crude, fields in Burke and Bottineau counties to Minot, N. D., $3½ million, contract let on 50 miles to **Curran and Company.**

Hope Natural Gas Company, Clarksburg, W. Va., 20 miles, 20-inch, gas, in Lewis, Ritchie and Pleasants counties, W. Va., $2 million, FPC authorization.

Houston Texas Gas & Oil Corp., St. Petersburg, Fla., 199 miles, 2 to 6-inch, gas, laterals; 20,000 hp in five new stations; $12 million, before FPC.

Iron Ranges Natural Gas Co., 115 miles, gas, from Itasca and St. Louis counties along route of Mesabi range from Grand Rapids to Aurora, Minn., $5 million, FPC authorization.

60 miles from Duluth to Silver Bay, Minn., FPC authorization.

Kansas-Nebraska Natural Gas Company, Hastings, Neb., 165 miles, 2-8-inch, gas, extension from Alliance, Neb., to Chadron, Crawford, Hemingford, Hay Springs, Gordon and Rushville, Neb., before FPC.

45 miles, 2-3-inch, gas, in Kansas, approved by Kansas Corporation Commission.

2,000 hp addition at Scott City, Kan., FPC approval authorization.

2,500 hp addition at Holcomb, Kan., before FPC.

Lo-Vaca Gathering Co., 230 miles, 6-20-inch, gas, gathering, Live Oak to Lavaca County, Texas, planned.

Matador Pipe Line Corp., Denver 175 miles, crude, from Bottineau, Burke and Renville counties, N. D., to Cromer, Man., Canada, $4 million, proposed.

Michigan Wisconsin Pipe Line Co., Detroit.

37 miles, 6 and 12-inch lateral loops in Wisconsin, before FPC.

29 miles, 30-inch, loops, Illinois, Indiana, and Michigan, 3,000 hp. station, Janesville, Wis., before FPC.

Two 2,000 hp units at Meade, Kansas; one 2,000 hp unit at Havensville, Kansas, before FPC.

Mid-America Pipe Line Co., 405 miles, 10-inch, LPG, Superior, Wis., to Chicago, $12 million, considered.

Mississippi River Fuel Corp., St. Louis 20 miles, 12-inch, 3 miles, 4-inch, gas, 2,500 hp station, to develop underground storage reservoir at St. Jacobs field in Madison and St. Clair counties, Ill., $3 million. Before FPC.

Mississippi River Transmission Corp., (subsidiary Mississippi River Fuel), 115 miles, 18-inch, gas, southeast Missouri to St. Louis County, FPC authorization.

Natural Gas Gathering Co., Inc., (joint venture with Gulf Resources, Inc.) gas gathering facilities in Zapata and Starr counties Texas, contract let to **H. S. Shanks Company.**

Natural Gas Pipeline Company, Chicago, 62 miles, gas, pipe line and various river crossings, before FPC.

New Haven Pipeline, Inc., products line, New Haven, Conn. to Springfield, Mass., $2.5 million, planned.

Niagara Mohawk Power Corp., 122 miles, 12-inch, Watertown and Massena, N. Y., contract let to Fulghum Contracting Corporation pending FPC approval.

Northern Natural Gas Company, Omaha, Neb., 236 miles, gas, in Kansas, Nebraska, Iowa, Illinois and Wisconsin, and 14,050 hp, $25 million, before FPC.

124 miles, in Oklahoma, Kansas, Nebraska, Iowa, and Minnesota and 17,360 hp, $17 million, before FPC.

22 miles, in Iowa, $673,100, before FPC.

Northwestern Refining Co., crude gathering system, Rival and Lignite fields, North Dakota, $625,000, Public Service Commission approval.

Ohio Fuel Gas Co., 59 miles, gas, 4-24-inch main lines, in Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingum, Stark and Wayne counties, Ohio, $5.1 million, planned.

Pacific Gas & Electric Co., San Francisco, 296 miles, 36-inch, gas, from Malin, Ore., to Antioch, Calif., southern section of line from Canada to California, $82 million, contract let to **H. C. Price Company.**

Pacific Gas Transmission Co., San Francisco, 614 miles, 36-inch, Kingsgate, B.C. to Malin, Ore., northern section of Canada to California line, $133 million contracts let to **H. C. Price Co., Western Pipe Line, Inc.,** and **J. P. Neill and Co.**

Panhandle Eastern Pipe Line Co., Kansas City, 305 miles, 30-inch, 40 miles, 26-inch, gas, loops, and 43,000 hp, and gathering facilities, $60 million, before FPC.

200 miles, 22-24-inch, gas, lateral, from Elk City, Okla., to Haven, Kan., before FPC.

Pan American Gas Company, Tulsa, 50 miles, 12-inch, gas, La Porte to Pasadena to Texas City, Texas, planned.

Peoples Gas Light & Coke, Chicago, 29 miles, 36-inch, gas between North Shore and Calumet stations, planned.

Peoples Gulf Coast Pipeline Company, Chicago, 27 miles, gas and turbocharger additions to 71 compressor engines, befor FPC.

Rio Gas Gathering Co., San Antonio, 97 miles, 3 to 8-inch, gas gathering, South Texas, to supply gas to El Paso Natural Gas Company, planned.

Seadrift Pipeline Co., Seadrift, Texas, 107 miles, 6-inch, LPG, Markham to Texas City, Texas, contract let to **H & K Construction and Roy Vickers Co.** joint venture, and **Houston Contracting Co.**

Southern California and Southern Counties Gas Cos., Los Angeles, 93 miles, 34-inch, California-Nevada border to Newberry, Calif., approved.

St. Lawrence Gas Company, Inc., Ogdensburg, N. Y., 75 miles, gas, main, United States-Canadian border to Ogdensburg, N. Y., $3.4 million, FPC examiner approval.

Tennessee Gas Pipeline Co., Houston 191 miles, 30 and 36-inch loops, in Ohio, Pennsylvania and New York, 72 miles of gathering lines and 43,600 hp in five stations, $46 million before FPC.

158 miles, 36-inch, gas, loops in Mississippi and Louisiana, FPC authorization.

21 miles, 16-inch, 2 miles, 12-inch, gas, Louisiana coast, Vermilion blocks 46 and 64, $3 million, before FPC.

50 miles, 10-16-inch, gas, offshore Louisiana, FPC authorization.

Texas Eastern Transmission Corp., Shreveport, La.

66 miles, 30-inch, gas, loops, between Vidor, Texas and Lambertville, N. J., and 33,710 hp in four existing stations, $17.5 million, temporary FPC authorization.

Extension of products line from Lebanon, Ohio, to Elmira, N.Y., considered.

350 miles, 24-inch, coal slurry, West Virginia to New York, considered.

Texas Gas Transmission Corp., Owensboro, Ky., 96 miles, 26-30-inch, gas loops, Louisiana, Arkansas, Mississippi, Tennessee, Kentucky and Indiana; 50 miles, 8 and 16-inch extension into Terrebonne, La. producing area, $16.8 million, before FPC.

Transcontinental Gas Pipe Line Corporation, Houston.

211 miles, 36-inch, and 69 miles, 30-inch, loops and additional 32,040 hp, in Texas, Louisiana, Mississippi, Alabama, Georgia and South Carolina, $52 million, FPC examiner approval.

13 miles, 24-inch and 18 miles, 20-inch loops, Louisiana, FPC authorization. 14 miles, 16-inch laterals, 1-mile, 12-inch lateral, Louisiana, $2.1 million, FPC authorization.

29 miles, 20-inch, gas, and 2,500 hp, in South Texas to take gas from South Texas Natural Gas Gathering Co., $2.4 million, FPC authorization.

Trans-Southern Pipeline Corp., Houston, 1,080 miles, 12-inch, LPG, from Mont Belvieu, Texas, to Danville, Va., and 215-mile spur line from Atlanta to Georgia-Florida border, $63 million, planned.

Transwestern Pipeline Co., Houston, 24 miles, 8-inch, 3,520 hp station and additional 1,000 hp, $2.5 million, temporary FPC authorization.

Trunkline Gas Company, Houston, 252 miles, 30-inch loops, and 140 miles, laterals, between Longville, La., and Tuscola, Ill., $45 million, authorized in part.

Underground Storage & Exploration, Upper Darby, Penn., 394 miles, 12-inch LPG, from Moundsville, W. Va. to Newark, N. J., $9 million, approved.

95 miles, 6-8 inch, laterals to Mauch Chunk, Penn., and to Philadelphia, planned.

United Gas Pipe Line Co., Shreveport, La., 59 miles, 36-inch, gas, lateral between Bastian Bay field and Plaquemines Parish, La., before FPC.

Valley Gas Transmission, Inc., Houston, 55 miles, 3 to 8-inch, gas, gathering, in Hidalgo, Brooks, Starr and Jim Wells counties, Texas, $15 million, before FPC.

West Shore Pipe Line Co., 250 miles, 10-16-inch, products, East Chicago, Ind., to Green Bay, Wis., planned.

William Lyles Co., 96 miles, 6-inch, jet fuel line for U.S. Navy, from air station Lemoore to Estero Bay, Calif., contract let to **Alex Robertson Company.**

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., to Bella Coola, B. C., before B. C. government.

Ajax Alberta Pipeline Ltd., 28 miles, 10-inch, gas, main, Morinville to Westlock, Alta., planned.

Alberta Gas Trunk Line Company, 386 miles, 26-36-inch, gas, main, Berland River area, Alberta, to Alberta-British Columbia border; and 235 miles, 8-18-inch, gas, gathering, Alberta, $100 million, contracts let to **Majestic Contractors, Ltd., Mannix Co., Ltd., Dutton-Williams Brothers, Ltd.**, and **Piggott Construction, Ltd.**

Alberta Natural Gas Company (Jointly owned by Westcoast Transmission Co. and Alberta & Southern Gas Co. Ltd.) 110 miles, 36-inch, gas, Alberta border to British Columbia-Idaho border, supply gas to Pacific Gas & Electric Co., contract let to **Price-Poole of Canada, Ltd.**

Assistencia de Oleodutos du Petrobras, Rio de Janeiro, 280 miles, 12-inch, crude, Rio de Janeiro to Belo Horizonte, Brazil, planned.

Abu Dhabi Marine Areas Ltd., (British Petroleum Co. and Compagnie Francaise Des Petroles) 20 miles, 18-inch, crude, from Umm Shaif offshore oilfield to Das Island, Persian Gulf, planned.

Barnabos Group (Italian Interests), crude line from Venice, Italy, to Insbruck, Austria, with extension to Munich, Germany, planned.

Bituminous Oil Pipeline Co., Calgary, 250 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, approved.

British American Oil Co., Ltd., Toronto, 125 miles, gas, Pincher Creek fields to Calgary, Alta., before Alberta Public Utilities Board.

Burmah Oil Co., Ltd., 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta, India. Contract let on 250 miles to Mannesmann-Saipem.

Cartier Gas Corp. (St. Maurice Gas, Inc., and Consumers Gas Co., Toronto), 170 miles, gas, Montreal to Quebec City, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

Creole Petroleum Co., 44 miles, 12-30-inch, gas, Bachaquero to Tia Juana, Venezuela, planned.

Foothills Pipe Lines Ltd., 1,300 miles, LPG, from Alberta-Saskatchewan border to Chicago, tie-in with Westalta Products Pipeline proposed system in Alberta, $100 million, before Alberta Board of Public Utilities Commissioners.

Gas del Estado, Buenos Aires, 1,050 miles, 30-inch, gas, Comodoro Rivadavia field to Buenos Aires, $380 million, bids submitted for design and construction by Texas Eastern Transmission Corp., ENI, and an Argentine firm.

Gas Trunk Line of British Columbia, Vancouver, 250 miles, 30-inch, gas, main, Fort Nelson to Taylor, B. C., planned.

Gases Naturales de Colombia, S.A., 140-mile, 10-inch, gas, Cicuco field to Barranquilla, Colombia, planned.

Hughenden Pipeline, 125 miles, products, Dick Lake gasoline plant to Hughenden Region, Alta., planned.

Hydrocarbons Pipeline, Ltd., Winnipeg, Manitoba, 880 miles, 6-8 inch, products, from Edmonton to Winnipeg, $35 million, partial authorization.

Independent Pipe Line Co., 2,019 miles, 34-36-inch, crude, Edmonton to Montreal, 23,000 pump horsepower, $395 million, before Borden Commission.

Interprovincial Pipe Line Company, 350-mile extension from Toronto to Montreal, looping line from Edmonton to Toronto, crude, $240 million, considered.

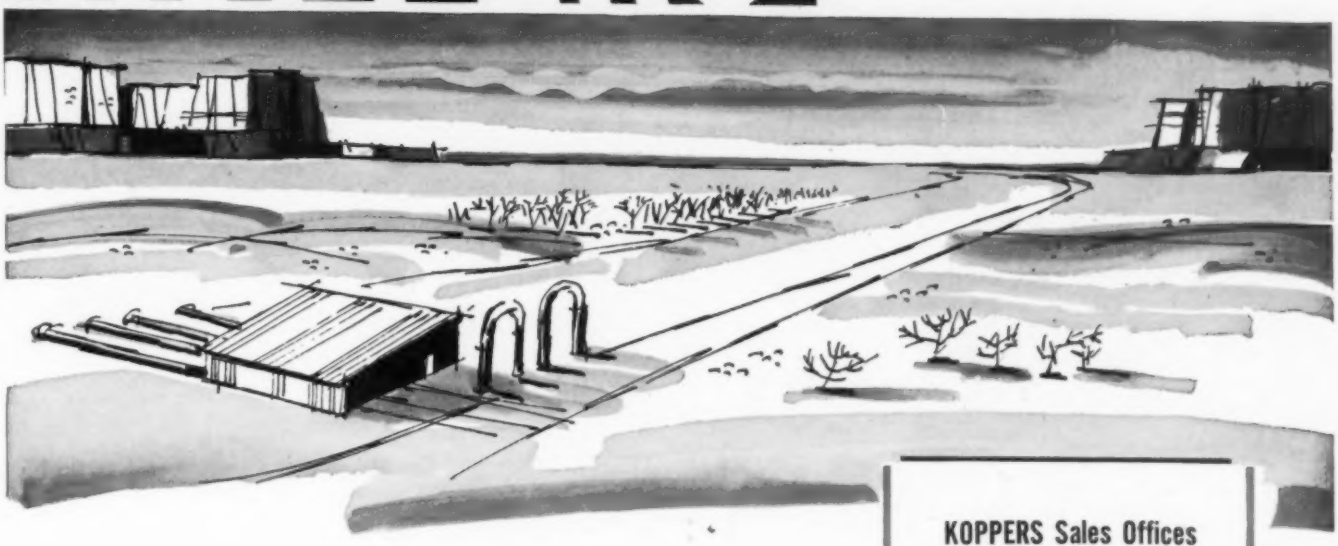
Additional horsepower in four new stations and several existing stations, $9.3 million, planned.

Magna Pipeline Co., 25 miles, 4-inch, gas, Vancouver, B.C. to Vancouver Island, $14 million, underway.

Mid-Continent Pipe Lines, Ltd., 1500-mile, 30-inch crude, Edmonton to Chicago, planned.

KOPPERS

on-the-spot availability of rings keeps your lines "on stream"



Dependable performance in all oil and gas applications

Koppers Piston Rings are now available in the field in a complete range of materials and a wide selection of types and sizes for every application in the oil and gas industry.

To gain trouble-free performance, lower operating costs and less frequent down-time, select Koppers Piston Rings—the choice of many original equipment manufacturers.

Koppers Piston Ring dependability, in even the most rugged applications, is backed with 38 years of experience in manufacturing rings of predictable performance.

If you have a ring problem, consult your Koppers field agent or write: KOPPERS COMPANY, INC., Piston and Sealing Ring Department, 7112 Scott Street, Baltimore 3, Maryland.

Send now for Koppers recommended Piston Ring Set-Ups applicable to the engines which you operate.

KOPPERS Sales Offices and Agents in these convenient locations:

Koppers Co., Inc.
District Sales Office
318 N. Pearl St.
Dallas 1, Texas

Lynn Elliot Co.
371 M & M Bldg.
Houston 2, Texas

Tri-State Industrial
Supply Company
520 Hawkins Way
El Paso, Texas

Nolan Sales Corp.
421 N. Cincinnati St.
Tulsa 20, Oklahoma

D. G. Silvey Co.
316 E. Kings Highway
Shreveport, Louisiana

Sample Bros.
2010 Big Bend Blvd.
St. Louis 17, Missouri

Sample Bros.
6315 Brookside Plaza
Kansas City 13, Missouri

Nelson-Dunn, Inc.
4450 E. Washington Blvd.
Los Angeles 23, California

Belen-Lynn McGuffy Co., Ltd.
P.O. Box 691
80 Gloucester Crescent
Calgary, Alberta, Canada

KOPPERS

AMERICAN HAMMERED® INDUSTRIAL PISTON RINGS

Engineered Products Sold with *Service*

For more data on advertised products, use Readers' Service Cards, last page.

FLEET-LINE®

WELDING FITTINGS

•

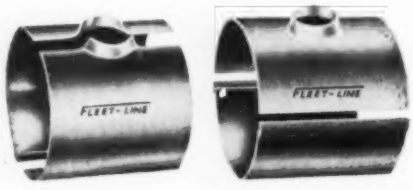
LITERATURE BY AIR MAIL...

...ask for it now.

REDUCERS: Concentric and eccentric. Nominal pipe sizes 1" to 30", ASA B16.9, ASTM A234. Schedules 10 to 160, stainless steel, and other alloys. Special lengths and sizes.

SADDLES: Conventional, and for pressure vessel heads. Nozzle sizes from ¼" to 24". Fleet-Line saddles weld neatly into place in much less time, and with much less welding rod.

Full encirclement saddles.



REDUCING TEES, Forged Steel Manifold Type.

Dealers and Stocking Distributors throughout the United States and Canada.

All orders acknowledged by air mail or long distance telephone and filled at once.

STEEL FORGINGS, Inc.

P. O. Box 276K • Shreveport, La.

PROPOSED CONSTRUCTION

continued

Naphtha Israel Oil Co., 75 miles, 6-inch, gas, Rosh-Zohar field to Ashdod Yam on Mediterranean planned.

National Iranian Oil Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran. $5 million, planned.

Northern Alberta Pipe Lines, Ltd., Edmonton, Alta., 110 miles, 10-inch, gas, main, Lac La Biche to Edmonton, $3 million, planned.

Northern Pipe Line Company, 153 miles, 16-inch, crude, from Regina, Saskatchewan, to Clearbrook, Minn., $10 million, planned.

Oasis Oil Co., of Libya, (Amerada, Continental and Ohio Oil Company), 86 miles, 30-inch, Dahra field to Es Sider, Libya; 36 miles, 20-inch, Mabruk to point between Es Sider-Dahra, before Libyan Petroleum Commission.

Peace River Oil Pipe Line Co., Ltd., 70-mile, crude, Swan Hills to Iosegun Junction, approved.

Pembina Pipe Line, Ltd., Edmonton, 1,200 miles, LPG, from Alberta gas fields to eastern Canada, planned.

Petroleos Mexicanos, 4, 6 and 8-inch, products, Mexico City-Puebla to Cuernavaca, planned.

1,240 miles, 34-inch, gas, Reynosa to Mexicali, Mexico $160 million, negotiating with Tennessee Gas Pipeline Company for design and construction of the line.

8-inch, products, and 12-inch, gas Torreon to Chihuahua, to be built in gas line underway.

360 mile, 12-inch, products, Minatitlan to Puebla and Mexico City, construction to start in 1960.

Products, Guadalajara to Tepic, planned.

Products, Aguascalientes to Zacatecas, planned.

6-inch, products, Guaymas to Ciudad Obregon, considered.

8-inch products, Guaymas to Hermosillo, considered.

8-inch, gas, Tierra Blanca to Veracruz, to be built in 1960.

14-inch, gas, Mexico City to Salamanca, underway.

Gas, Ciudad Carmen to Ciudad Pemex.

8-inch, crude Comalcalco to Minatitlan, to be built in 1960.

Crude, Minatitlan to Salina Cruz, contingent on proposed refinery on Pacific Coast.

149 miles, 10-inch, products, Ciudad Pemex to Minatitlan, planned.

181 miles, 4-inch, products, Mexico City to Salamanca, planned.

Pipelines of Puerto Rico, Inc., 95 miles, 8-inch, products, Penuelas to San Juan, Puerto Rico, approved.

Provincial Pipe Lines, Ltd., 700 miles, 3-16-inch, hydrocarbon line gathering system in Alberta, $25 million, before Alberta Oil and Gas Conservation Board.

Qatar Petroleum Company, Qatar, 60 miles, 6-10-inch, gas, Dukhan to Doha, Qatar, engineering contract let to Pencol Pipeline & Engineering Consultants.

Quebec Gas Transmission Lines, Inc., Montreal, 300 miles, gas, main, Quebec to Montreal, planned.

Rangeland Pipe Line Company Limited, 111 miles, 8-inch, crude, southeastern Alberta to Calgary, $3 million, planned.

Saskatchewan Power Corp., 179 miles, 4-6-8-inch, gas, planned.

Societa Nazionale Metanodotti, 650 miles, 18-inch, crude, Genoa, to Milan-Cremona-Torino, Italy, and Aigle, Switzerland, with extensions to Karlsruhe and Munich, Germany, planned.

Societe d'Etude du Pipe Line Sud-European, Paris, 419 miles, 30-inch, crude, port of Lavera to Strasbourg, with lateral extending 40 miles to Karlsruhe, Germany, approved by French cabinet.

Soc. Siciliana Metanadotti, gas line from Hassi R'Mel field in Algeria through Tunisia, across Mediterranean to Sicily and into Italy, considered.

SN Repal, Paris, France, 180 miles, 8-inch, gas condensate, Massi R'Mel to terminal on Hassi Messaoud to Bougie line in Algeria, planned for 1961.

Standard-Vacuum Oil Company, 60 miles, 8-inch, gas, main, in South Sumatra, considered.

FASTER— MORE ECONOMICAL

PIPE COATING

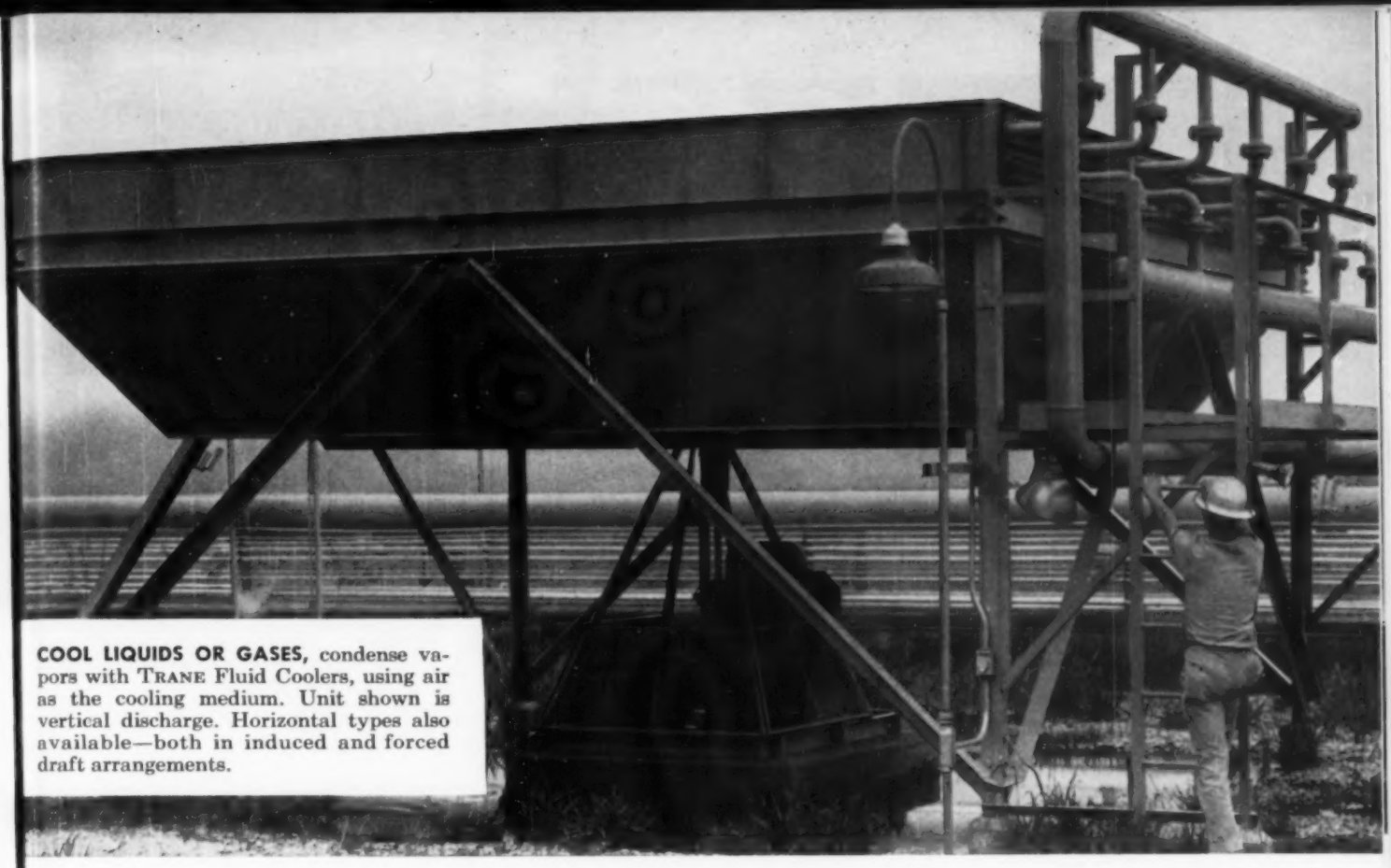
Strategically located for barge, truck and rail.

for further information, write:

SOUTHERN PIPE COATING, INC.

MEMPHIS, TENN.

Box 2264 **WH 2-2226**



COOL LIQUIDS OR GASES, condense vapors with TRANE Fluid Coolers, using air as the cooling medium. Unit shown is vertical discharge. Horizontal types also available—both in induced and forced draft arrangements.

Lower erection costs, operating costs ...with versatile Trane Fluid Coolers!

Air-cooling now solving water supply problems for many refineries, petrochemical and natural gasoline plants

More and more engineers and plant designers are finding that *air-cooled heat exchangers* eliminate water supply and maintenance problems encountered with conventional cooling towers. These engineers report a substantial net reduction in over-all cooling costs and water consumption. Here are some of the ways TRANE Fluid Coolers are helping to solve heat transfer problems in many refineries and plants:

- **Low first cost.** Erection is simpler; fan, motor and gearbox are factory-aligned on a single metal base. Framework parts are pre-drilled, match-marked. Compact, simple, TRANE Coolers can often be installed on roofs, cutting real estate costs.
- **Lower operating costs.** Equipment needs only periodic cleaning of fin-tube surface. No need for special crews, maintenance facilities or spare parts. And TRANE Fluid Coolers have a life expectancy of 15-20 years—compared with 7-10 years for cooling towers.
- **Superior performance.** TRANE Coolers available with Admiralty stainless and carbon steel tubing to meet the most exacting specifications. Units are now in use in Canada and Bermuda—meeting extreme weather conditions. They also solve the problem of corrosion caused by salt-air atmosphere.

WANT MORE FACTS?

New Catalog S-395 has complete specification and application data on TRANE Fluid Coolers. For your copy, write TRANE, La Crosse, Wisconsin. Or just call your nearby TRANE Sales Office.

For any air condition, turn to

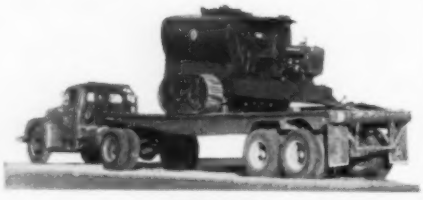
TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA. • CLARKSVILLE MFG. DIV., CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA, LIMITED, TORONTO • 97 U. S. AND 19 CANADIAN OFFICES

DOPE
IS ALWAYS
HOT • READY
and RIGHT
from
MYOCO ASPHALT
KETTLES

Myoco asphalt kettles are designed to keep dope hot and always ready for instant use. Completely insulated, there is almost no temperature variation of filler between top and bottom. Coking, therefore, is unnecessary. Mechanically driven propeller and hydraulic bottom sweep prevent settling. Since the fuel tank is installed inside of frame, and protected from the firebox by the welded bulkhead, safety is assured. Available in 10, 27 and 30 barrel sizes, powered by a Wisconsin engine or its electric equivalent with Athey tracks, steel skids, or fitted for stationary use. Blower or mailbox burners are optional.



PORTABLE

The Myoco portable kettle is compactly designed to eliminate over-width permit for highway transportation.

WE RENT EVERYTHING
FOR PIPELINE CONSTRUCTION
Write for our Complete Catalog

MYOCO

MORRIS-YOUNG-OWENS CO.
PIPELINE EQUIPMENT AND SUPPLIES
P. O. Box 35137 • Houston 35, Texas
PArkview 3-0110
In Canada: MYOCO LIMITED, Rural Route 1, Midland Ave. N., Agincourt, Ontario, Canada
Tel. WA 2-9444

PROPOSED CONSTRUCTION
continued

Ste. d-Etudes de Pipeline Intercontinetaux, Paris, 1,400 miles, 30-40-inch, gas, from Hassi R'Mel field in central Algeria across Mediterranean, through Spain, France and into West Germany, considered, Fish International Corporation making engineering and feasibility studies.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

130 miles, 16-inch, gas, main line, Multan to Lyallpur, planned.

Syrian Pipeline, Damascus, 500 miles, crude, from Karshuk field, Syria to Mediterranean, planned.

300 miles, products, from Homs to tank farms in Damascus, Aleppo and Latakia, planned.

Trans-Canada Pipe Lines Limited, Toronto.

268 miles, 34-inch, loops, and additional hp planned for 1961, $69 million.

122 miles, 34-inch, loops, hp additions, $46 million, planned for 1962.

Trans-Prairie Pipelines, Ltd., Edmonton, crude line, from Weyburn field to Regina-Moose Jaw areas, $5 million, considered.

Westalta Products Pipeline Ltd., 900 miles, LPG, from Northern Alberta to Saskatchewan border, to deliver hydrocarbons to Foothills Pipe Lines, $40 million, before Alberta Board of Public Utilities Commissioners.

Williams-McWilliams Industries, Inc., New York, 441 miles, 6-inch, crude, Villa Montes, Bolivia to Villa Hayes, Paraguay, considered.

Westcoast Transmission Company, 688 miles, 30-inch, gas, loops, Peace River area of British Columbia to United States border, planned.

ON THE LINE

PLCA Convention

The thirteenth annual convention of the Pipe Line Contractors Association will be held January 15-18 at the Mark Hopkins and Fairmont Hotels in San Francisco.

Speakers at the meeting will include Gardiner Symonds, chairman of Tennessee Gas Transmission Company, George R. Perrine, chairman of the Illinois Commerce Commission, and Morris Frank, Houston Chronicle columnist and humorist. Other speakers will be announced later.

The PLCA has announced that it will hold its 1962 convention at the Boca Raton Hotel and Club, Boca Raton, Fla., January 7-10.

REPAIR PIPE LEAKS
QUICKLY
PERMANENTLY
ANY PRESSURE
ANY TEMPERATURE

SKINNER-SEAL
EMERGENCY PIPE CLAMPS for safe, sure lasting repair of splits and rust holes in pipe. No pressure too high. Anyone can apply in a few moments. Made in all sizes, ½" to 12", for steel and C. I. pipe. Stocked by practically all oil supply stores.

SKINNER-SEAL
COLLAR LEAK CLAMPS — for oil and gas lines. Gasket is sealed by gasket container rings—pressure is sealed in . . . air, moisture and gasket-destroying soil conditions are sealed out. Effective under any pressure. Sizes 2"—13" O.D. incl. In stock at oil supply stores!

For over half a century, a complete line of Repair Clamps and Saddles for steel and cast iron pipe. Send for catalog!

M. B. SKINNER CO.
SOUTH BEND 21, INDIANA

Christmas
Greetings
1960
FIGHT
TB
WITH
CHRISTMAS
SEALS
ANSWER YOUR CHRISTMAS
SEAL LETTER TODAY

Merry Christmas ✳ Happy New Year

standard pipeprotection inc.

3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MO.

The seventh annual convention of the Pipe Line Contractors Association of Canada will be held at the Empress Hotel in Victoria, B. C., February 23-25.

Regulation Problems

Several talks dealing with the regulation problems in pipe line business will be heard at the Southwestern Legal Foundation's twelfth annual institute on the law of oil, gas and taxation set for February 8-10 in Dallas.

David T. Searls, vice president and general counsel for Gulf Oil Corporation will discuss the decision of the FPC in the Phillips Petroleum Company case.

Some of the other speakers include Willard W. Gatchell, Washington, D. C. attorney and former general counsel of the FPC, who will speak on "Some Basic Factors and Trends in Some Phases of Public Utility Law." Wm. J. Holloway, Jr., Oklahoma City attorney, will discuss "Some FPC Problems Encountered in General Oil and Gas Practice," and Washington attorney William P. McClure will talk on "Sales of Gas Leasehold Interests."

Registration will be $50 for all sessions or $20 for single day attendance. Southwest Legal Foundation members will be admitted without charge. Copies of program or additional information may be obtained from the Southwestern Legal Foundation, Hillcrest at Daniels, Dallas 5, Texas.

Buckeye Buys Pipe Line

Buckeye Pipe Line Company has purchased the Tuscarora Pipe Line Company from the Esso Standard division of Humble Oil & Refining Company. The name is not being sold the companies reported.

Tuscarora operates a 300-mile refined products system in Pennsylvania extending from the Buckeye system near Allentown to Midland, Pa. The system is made up of 10 and 12-inch lines and there are terminals near Reading, Harrisburg, Johnstown, Altoona, Pittsburgh and Midland. Most of the field personnel now employed by Tuscarora will continue to operate these facilities.

The original facilities were constructed in 1908 and then the line was rebuilt in 1953.

Solar gas turbine stimulates production of oil and gas wells

OIL FRACTURING OPERATIONS – used to stimulate production of oil and gas wells – must take place at the well site. This means that fracturing and acidizing pumping units must be lightweight and mobile – yet provide in excess of 1000 hydraulic horsepower for most operations.

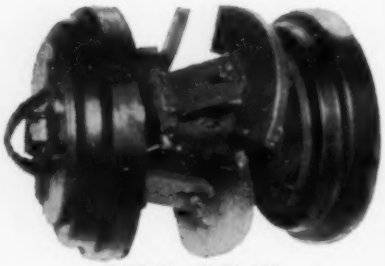
The Western Company's new 1000 hydraulic horsepower fracturing pump is powered by Solar's *Saturn* T-1000 gas turbine engine. Up to 1250 hp is required to drive the pump in this application. Weight of the truck and turbine-driven fracturing unit is significantly less than 500 hp diesel units currently used by Western. The *Saturn* T-1000 turbine-powered pump delivers twice the hydraulic hp of the diesel units – reducing by 50% the number of units needed per operation.

The *Saturn* T-1000 engine weighs only 1200 lbs and occupies less than 51 cubic feet. It is simple in design, starts instantly from –65 degrees F to 130 degrees F, and takes full load in seconds without warmup. It has been engineered for simplicity of operation and long life under industrial conditions. As a compact and reliable power source for generators, compressors, pumps, and other oilfield equipment... investigate the *Saturn* T-1000 gas turbine. There's a Solar gas turbine for almost every application in the 50 to 1250 hp field. Write for particulars to Dept. H-186, Solar Aircraft Company, San Diego, California.

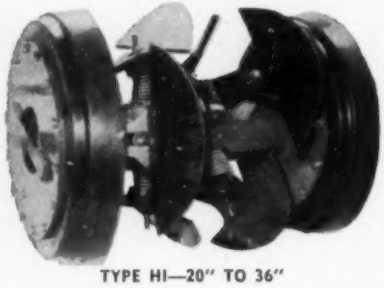
SOLAR
AIRCRAFT COMPANY
A subsidiary of International Harvester Company

If you have a special problem...

we can help you!



TYPE HI—6" TO 18"



TYPE HI—20" TO 36"

TYPE HI—6" to 36"

The latest development in pipe cleaning tools.

CONSTRUCTION

These springs extend through the center of the unit to blades on the opposite side of the unit which gives it a maximum of flexibility. The heavy springs on this unit help to keep it centered in the pipe supporting its own weight which will give far greater cup life.

DESIGN

This unit is ideal for first run on new construction, or for extremely corroded pipelines.

PIPELINE CLEANERS CO.

FORT MADISON, IOWA
PHONE DRake 2-2051

What's Happening among MEN in the INDUSTRY

J. A. Rupf has been elected president of **South Saskatchewan Pipe Line Co.,** Regina, Can., and will assume his duties immediately.

J. A. Rupf

He was formerly senior electrical engineer for **Magnolia Pipe Line Co.,** a common carrier affiliate of the Mobil organization. The Saskatchewan company is partially owned by Mobil Oil of Canada, Ltd.

Rupf succeeds **J. S. Black** who has been named manager of Mobil Oil Company's West Coast Pipe Lines, effective December 31.

He joined the Mobil organization in 1935 as an assistant engineer in the Central Pipe Line Division at Wichita, Kan. He became assistant chief engineer in 1949, and chief engineer in 1951. In 1957 he was placed on special assignment in Sumatra as manager of construction for a pipe line there. In 1958 he returned to Wichita and in early 1960, transferred to Magnolia Pipe Line Co., Dallas.

G. E. Ruffin has been named assistant manager of personnel and industrial relations in **Shell Pipe Line Corp.,** head office in Houston.

Currently assistant manager of the same department at Shell's Martinez, Calif., refinery, Ruffin succeeds **J. A. Douglas,** who will become staff manager for **Shell Oil Company's** Administrative Services Department in New York.

Ruffin joined Shell at its Wood River, Ill., refinery in 1948, and served there as chief clerk and supervisor of employment.

Harold E. Vaughan, Transcontinental Gas Pipe Line Corporation, has been elected president of the newly formed **Natural Gas Men of Houston,** the first such organization in the Houston area.

The association was formed for men directly and professionally connected with the natural gas industry in either production, marketing, transmission or distribution. Meetings are designed for both business and educational purposes on common interests and problems.

Other officers include **H. L. McDonald, Pan American Petroleum Corp.,** first vice president; **E. Rue Thomas, Trunkline Gas Co.,** second vice president; **Lonnie E. Crawford, Humble Oil & Refining Co.,** third vice president; **Jack Gale,** Transcontinental, secretary; **E. H. Fenner, Shell Oil Co.,** treasurer.

Directors are **C. R. Worst, Natural Gas Pipeline Co. of America; T. C. Beavis, Tidewater Oil Co.; Quinton S. Drake, Lion Oil Co.; Joe Tamasey, Tennessee Gas Transmission Co.; W. D. Yale, Texaco, Inc; J. D. Mayhall, Superior Oil Co.; J. W. Mims, Phillips Petroleum Co.; Allan Hamill, Claud B. Hamill.**

By-laws of the organization were read and accepted at the October 27 meeting by the 35 members present. Officers and directors began serving at this meeting.

Hugh J. Davis has been named division landman for Texas Gas Exploration Foreign C. A. In his capacity as landman, Davis will supervise drilling agreements and the acquisition and maintenance of oil and gas leases for Texas Gas Exploration Foreign C. A., which recently established offices in the Anglo-American Building in Calgary, Alta.

Three appointments to key positions at **Transwestern Pipeline Company** have been announced today by **William B. Padon,** vice president and director. The appointments are **J. T. Wooten,** chief engineer; **J. H. Cretsinger,** head of the reserve and deliverability section and **Armando de Leon,** administrative assistant to Padon.

Wooten's experience includes pipe line engineering and project engineering in South America and the Northwest. He was chief engineer of Mississippi River Fuel Corporation prior to joining Transwestern.

Cretsinger participated in a two year study by the Texas Petroleum Research Committee of the primary and secondary oil reserves in the Gulf Coast area. Before joining Transwestern he was employed by Butler, Miller and Lents as a consulting engineer.

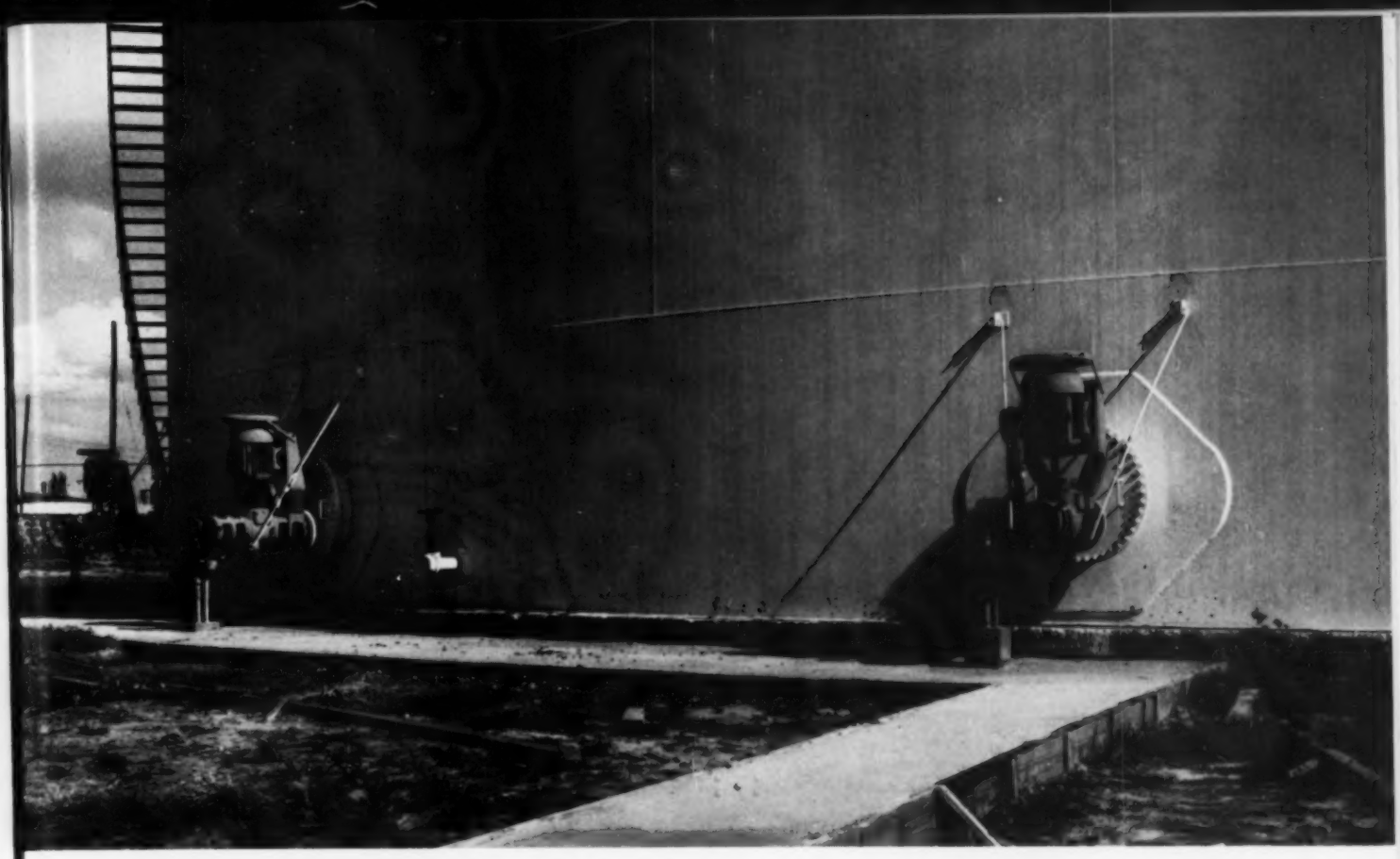
de Leon is a former supervisor of wage and salary administration for the Warren Petroleum Corporation. He has worked for Mene Grande Oil Company in Venezuela where he made a study and analysis of departmental problems and assisted in industrial relations work.

Monroe E. Spaght has been elected president of **Shell Oil Company** to succeed **H. S. M. Burns,** who will retire at the end of this year, it was announced by the company's board of directors.

Spaght, who started his career with Shell as a research chemist, has been an executive vice president since 1953. Previously, he was president of Shell Development Company. He is a director of Stanford Research Institute, American Petroleum Institute and the Institute of International Education. He is a trustee of Stanford University, from which he holds A.B., A.M. and Ph.D. degrees. In 1958, Rensselaer Polytechnic Institute conferred on him an honorary Doctor of Science degree.

T. F. Wingard, assistant manager Products Movements Department, **G. M. Stout,** Mid-Continent chief division dispatcher and **C. J. Snyder,** Mid-Continent assistant chief division dispatcher, figure in promotions at Sinclair Pipe Line Company general headquarters, Independence, Kan.

Wingard will take over the duties of assistant manager Crude Oil Movements Department; Stout will move to assistant manager, Products Movements Depart-



You save $1000 per tank per year

when you keep bottoms clean by pressing a button

Take a minute to add up what it costs you to clean out the sediment in an 80,000-barrel crude storage tank.

The answer—5000 to 8000 dollars—may amaze you. Yet these figures are based on careful field studies by a major pipeline company.

Your total cost includes:

- what you pay for cleaning
- your overhead while the tank is out of service
- value of refinable oil and wax you lose in the bottoms (at least $2000—and sometimes as high as $6000).

Fortunately, this is one expense you don't have to accept. Prevention is easy. Put LIGHTNIN Mixers on your tanks, and start enjoying savings *on the order of $1000 per 80,000-barrel tank per year.* Savings on larger tanks are equally spectacular.

No need to scrape out sludge

You eliminate sludge buildup—for good—when you install LIGHTNIN Mixers. By pressing a switch button, you start the tank contents in gentle motion that keeps sediment suspended in the crude, or resuspends any that has settled. You can keep bottom sediment level, year to year, as low as *one inch.*

You dispatch a more uniform crude when you use LIGHTNINs in your tanks. Crude leaving the tank has the same values as when it entered the tank. You overcome the risk of large slugs of accumulated sediment breaking loose and moving into the pipeline.

By eliminating downtime for sludge cleanout, you keep your tank farm's *full holding capacity* ready for use when you need it. You gain as much as 12% more storage capacity—without adding a single tank.

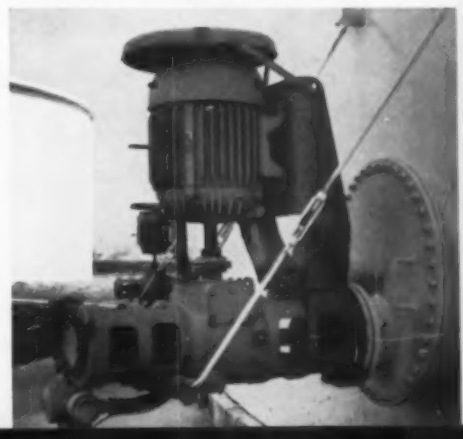
Do this today

More than 50 independent pipeline companies and about 35 leading producers and refiners are cutting crude storage costs this effortless LIGHTNIN way. So can you! To see how, just call in your LIGHTNIN Mixer representative (listed in Pipeline Composite Catalog). Or write us direct.

"Lightnin® Mixers"

MIXCO fluid mixing specialists

LOW OPERATING COST. It takes as little as one hour to suspend sediment in a full tank. Upkeep is simple; choice of stuffing boxes to meet your conditions, or mechanical seals that eliminate stuffing-box maintenance.

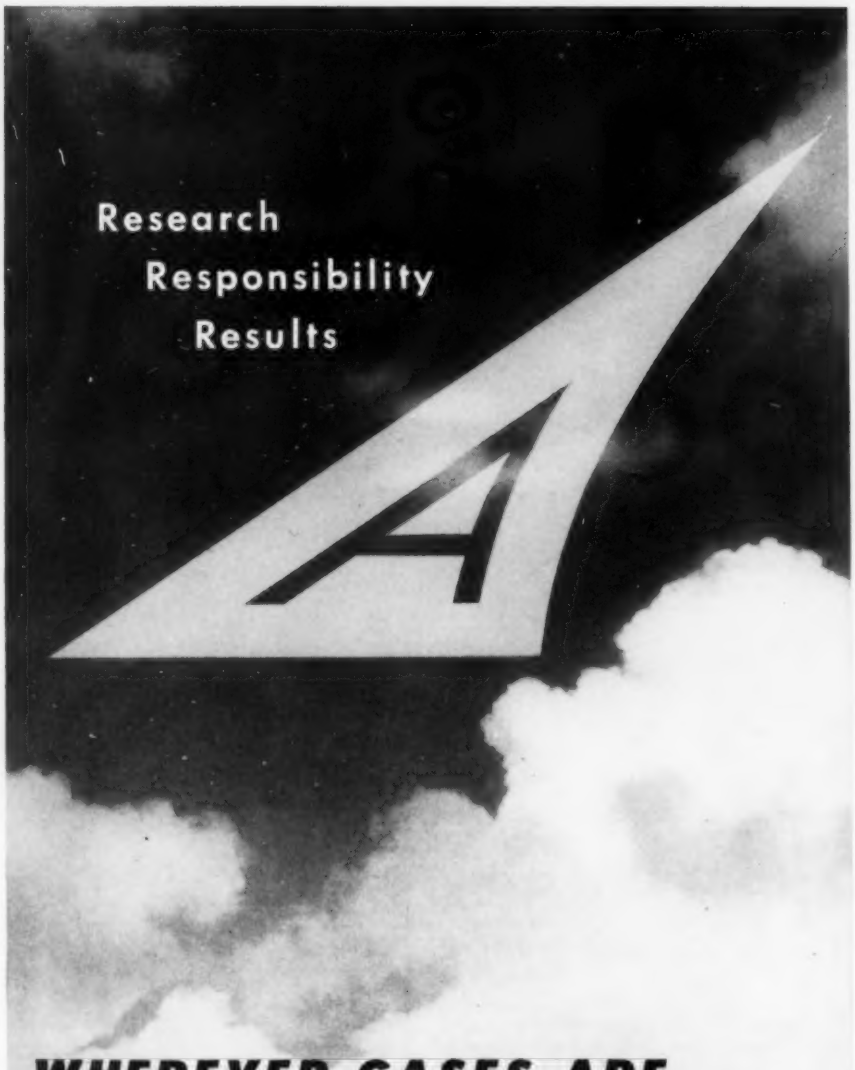


Get these helpful bulletins on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with your name and company address. Free—no obligation.

- ☐ BS&W Control with LIGHTNIN Mixers (B-503)
- ☐ Side entering mixers, 1 to 25 HP (B-104)
- ☐ Data sheet for figuring mixer requirements (B-107)
- ☐ Condensed catalog describing LIGHTNIN Mixers—all types (B-109)
- ☐ LIGHTNIN rotary mechanical seals for extra-low-cost mixing (B-111)

MIXING EQUIPMENT Co., Inc., 196-n Mt. Read Blvd., Rochester 3, N. Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Avenue, Toronto 19, Ont.



WHEREVER GASES ARE CLEANED OR HANDLED.

Aerotec Industries offers more than a half century of world wide experience in engineering and manufacturing equipment for efficient and economical cleaning and handling of air and gas. Single responsibility for complete systems, from design to final installation, assures management that overall performance guarantees will be met. Write for information on the products of interest.

AEROTEC INDUSTRIES
INCORPORATED
EXECUTIVE OFFICES • GREENWICH, CONN.
Plants at Bantam, Greenwich and So. Norwalk, Conn.
Canadian Affiliate: **T. C. CHOWN LIMITED,** *Montreal and Toronto*

Divisions: **INDUSTRIAL** • Electrical and Mechanical Dust Collectors • Wet Collectors • Fans • Fan-Stacks • Blowers • Gas Scrubbers • Air Preheaters • Curtain Dampers.
AIRCRAFT EQUIPMENT • Advanced electro-mechanical equipment for the aircraft, missile and nuclear industries.
AEROTHERM • Aircraft lounges, passenger and crew seating.

ment. Snyder was named division chief dispatcher, products. All three will be stationed at the main office, Sinclair Building Independence, Kan.

W. T. Thagard, manager of the Coordinating and Planning Department was named to the post of vice president of **Texas Eastern Transmission Corp.**

He will expedite diversification in the field of carrying coal by pipe line. Texas Eastern will work with the Consolidation Coal Company to transport coal by pipe line from West Virginia to electric utility companies on the Eastern Seaboard.

W. D. Morningstar has been named treasurer of **Pacific Lighting Gas Supply Co.,** natural gas transmission and storage utility. Morningstar, who has been assistant treasurer and assistant vice-president of the Los Angeles-based subsidiary of Pacific Lighting Corp., succeeds **C. Edward Pearman** who will retire.

W. D. Morningstar

Morningstar joined P.L.G.S. in 1951 as administrative aid. He was named auditor in 1954, and assistant treasurer and assistant vice-president in 1959.

Gulf Oil Corporation's board of directors has announced several major changes in the company's top management. Succeeding **Ralph O. Rhoades, W. K. Whiteford** was elected chairman of the board.

E. D. Brockett, formerly executive vice president, was elected President.

Whiteford has had a long career in the oil business that began in the early twenties. In 1935, he joined the British American Oil Company, Ltd., as executive vice president of its U. S. Producing subsidiary, British American Oil Producing Company.

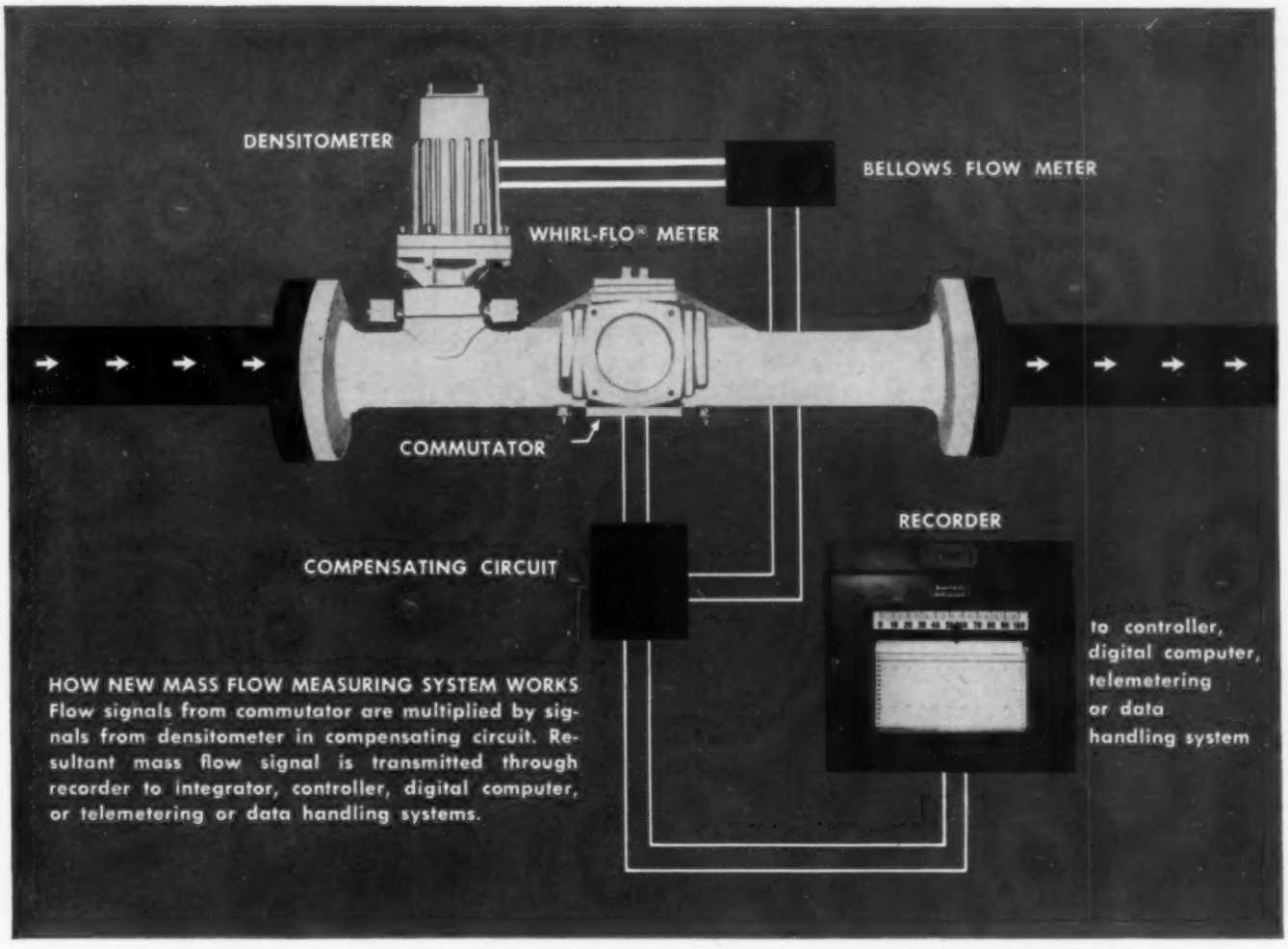
In October 1951, he was elected a director and executive vice president of Gulf Oil Corporation. Brockett joined the company in 1934. In 1955, be became a vice president and a director in 1958.

The promotion of **A. M. Hill** to the new post of technical supervisor of lines for **Service Pipe Line Co.** has been announced.

The appointment was part of a reorganization in which a single department, under assistant general manager **H. T. Chilton,** assumes the operating, maintenance and construction functions of Service's System.

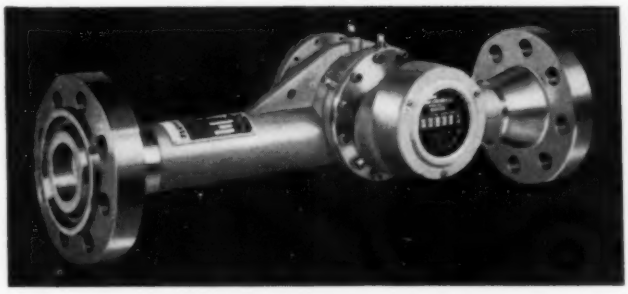
Hill, formerly maintenance superintendent, has been with the company for more than 37 years and is the author of numerous technical articles on pipe line repair and maintenance. He also designed several tools and other pieces of equipment now widely used in the pipe line industry.

R. M. Carter, newly appointed to the position of lines and tanks supervisor, will report to Hill under the reorganization plan, as will shop superintendent **A. I. Zumwalt** and contracting administrator **F. W. Zilm.**


DENSITOMETER
BELLOWS FLOW METER
WHIRL-FLO® METER
COMMUTATOR
RECORDER
COMPENSATING CIRCUIT
to controller, digital computer, telemetering or data handling system
HOW NEW MASS FLOW MEASURING SYSTEM WORKS
Flow signals from commutator are multiplied by signals from densitometer in compensating circuit. Resultant mass flow signal is transmitted through recorder to integrator, controller, digital computer, or telemetering or data handling systems.

NEW HONEYWELL MASS FLOW MEASURING SYSTEM

meters liquids and gases with accuracy of ±½%



Here's the system that delivers *accurate, automatic, and continuous mass flow measurements* of liquids and gases for the most demanding process control, accounting, and custody transfer applications.

By using the highly accurate Whirl-Flo® Meter as the primary element, Honeywell makes available a fully compensated mass flow measuring system that delivers linear accuracies of ±½% under most operating conditions regardless of changes in temperature, pressure, or compressibility of the liquids or gases being metered. All the primary and compensating elements are built right into the system.

®Trademark Rotron Controls Corporation

You get a mass flow measuring system that's custom made to suit your specific application.

This new mass flow system can be linked easily to telemetering and remote control systems, data handling, and process computers . . . can meter a wide variety of fluids—water, air, propane, butane, natural gas, gasoline, no. 2 fuel oil, ammonia, ethylene, and even some slurries. The flow meter body itself is available in standard sizes from 2 to 16 inches.

Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone. MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17.

75th YEAR — PIONEERING THE FUTURE

Honeywell

First in Control

SINCE 1885

2 TOUGH PIPELINE PROTECTORS

RUBEROID

ASBESTOS PIPELINE FELT...

Adheres to the pipe coating or enamel. Protects pipeline against root attack, soil distortion, and trench settlement which can occur from undergrowth in clay or rocky areas or where the soil is alternately wet and dry. Economical and long-lasting Ruberoid Pipeline Felt meets and exceeds the specifications of the American Waterworks Association and the National Association of Corrosion Engineers.

RUBEROID

FLEXIBLE ROCK SHIELD...

A durable pipeline protector. Guards pipelines in rocky and swampy areas, and at river, railroad and highway crossings. Also used to make tough saddle pads for river weights or hold-down anchors. Can be applied either in two pieces or by the cigarette wrap method. ½" or ¾" steel strapping with aluminum seals or use of filament tapes insures permanent placement of the shield. Saves time and effort. Light weight cuts freight cost.

For specification details and samples, write The RUBEROID Co., Industrial Products Division, 500 Fifth Ave., New York 36, N. Y.

The RUBEROID Co.®

PIPELINE PROTECTIVE COVERINGS THAT LAST

Five promotions in **Pacific Gas and Electric Company's** Gas Department have been announced. **Kenneth B. Anderson,** of Orinda, general superintendent, technical services, becomes manager, pipe line operations, succeeding **Ralph S. Nabors,** of San Francisco. Nabors becomes field supervisor of **Pacific Gas Transmission Company,** a PG&E affiliate that will own and operate the Idaho-Washington-Oregon portion of the 1,400-mile Canada-California natural gas pipe line.

Roscoe D. Smith, of San Anselmo, goes from general superintendent, transmission and distribution, to manager, gas system design. **Edward F. Sibley** of Piedmont, moves up to manager, gas distribution from his former duties as supervising administrative engineer. **Robert W. Brooks,** of Palo Alto, northern division superintendent, pipe line operations, becomes supervising administrative engineer.

Carl John Maki has been named manager of the Gas Supply Department for **Texas Eastern Transmission Corporation.**

He will be assisted by **John S. Adams,** who has been promoted to assistant manager of Texas Eastern's Gas Supply Department.

Carl John Maki

Maki will make his office in Houston where he will work directly under **John C. Jacobs,** vice president in charge of the company's gas purchase activities. In his new position Maki will have responsibility for the overall management of gas supply operations for Texas Eastern including negotiations covering new large purchases. He will also be responsible for administration of existing gas purchase contracts.

Adams will continue to maintain his office in Shreveport where he is in charge of the gas supply section in Gas Division headquarters.

Maki comes to Texas Eastern from Dresser Industries, Inc., where he was assistant to the vice president. Prior to that he served with Seaboard Oil Company and Mene Grande Oil Company, in Venezuela.

Richard W. Camp, Oklahoma City, was elected a vice president of **Arkansas Louisiana Gas Company** at a recent meeting of the board of directors. Camp will direct activities in the new Oklahoma-Kansas Division of Arkla Gas.

He is former president of Consolidated Gas Utilities Corp., which on August 31, was merged into and became a part of Arkla Gas. Since that time he has been manager of the Oklahoma-Kansas Division, which encompasses territory formerly served by Consolidated.

Camp started his gas industry career in 1928 when he joined Consolidated as a geological engineer. He was elected vice president of the company in 1946, and president in 1954.

F. V. Cook, master mechanic for **Service pipe line Co.,** has been promoted to the new position of technical supervisor of stations. Under his supervision will be more than 80-main line pump stations throughout the company's 15-state crude oil pipe line system.

the unique GREENHEAD sling...

you can field repair it in minutes!

Designed for safety: Every strength member is visible. You can see any damage and replace the member BEFORE an accident happens. Designed for purpose: Will not tear protective wrapping — minimum stretch. Engineered for strength. Manufactured for every use: All sizes, and parts, in inventory for immediate delivery. Let us quote you prices, not as much as you might think. Just call or write:

GREENHEAD, INC.

3800 West Alabama, Houston 27, Texas, Phone: MOhawk 7-3356.

Raymond C. Firestone, president, **The Firestone Tire & Rubber Co.,** and **Walter F. Carey,** president, **Automobile Carriers Inc.,** have joined the Advisory Committee of the Transportation Center at Northwestern University, Evanston, Ill.

The Transportation Center is a national educational and research organization serving the transportation industry. The Advisory Committee consists of 32 business and transportation leaders.

WHO'S MEETING WHERE

January

Pipe Line Contractors Association, annual meeting, Fairmont and Mark Hopkins Hotels, San Francisco, January 15-18.

ISA, winter instrument-automation conference and exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis, January 16-19.

NGAA, Gulf Coast Regional meeting, Robert Driscoll Hotel, Corpus Christi, Texas, January 20.

February

NGAA, South Louisiana Regional meeting, Lafayette Petroleum Club, Lafayette, La., February 24.

March

ASME, Gas Turbine Power Division, cosponsored by the Department of Defense, sixth annual conference and exhibit, Shoreham Hotel, Washington, D. C., March 5-9.

NACE, seventeenth annual conference, Hotel Statler, Buffalo, N. Y., March 13-17.

New England Gas Association, annual meeting, Hotel Statler, Boston, March 15-17.

NGAA, 40th Annual Convention, Baker Hotel, Dallas, March 15-17.

AGA General Management Section conference, Frances-Marion Hotel, Charleston, S.C., March 20-22.

American Society for Metals, 12th western metal congress and exposition, Pan American Auditorium, Los Angeles, March 20-24.

Mid-West Gas Association, annual meeting, Sheraton-Fontenelle Hotel, Omaha, Neb., March 27-29.

University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman, Okla., March 28-29.

April

University of Oklahoma, School of Mechanical Engineering, short course of industrial engines, University of Oklahoma, Norman, Okla., April 6-7.

ASME, oil and gas power conference and exhibit, Jung Hotel, New Orleans, April 9-13.

PIEA-PESA, annual meeting, Galveston, Texas, April 11-13.

University of Oklahoma, Southwest Gas Measurement Short Course, North Campus, Norman, Okla., April 18-20.

AIME Society of Petroleum Engineers, East-Texas, Louisiana, Arkansas gas technology symposium, Tyler, Texas, April 20-21.

Southern Gas Association, annual convention, New Orleans, April 24-26.

API, Division of Transportation, annual meeting, Chase Park Plaza Hotel, St. Louis, Mo., April 26-28.

NGAA, Oklahoma regional meeting, Lake Murray Lodge, Ardmore, Okla., April 28.

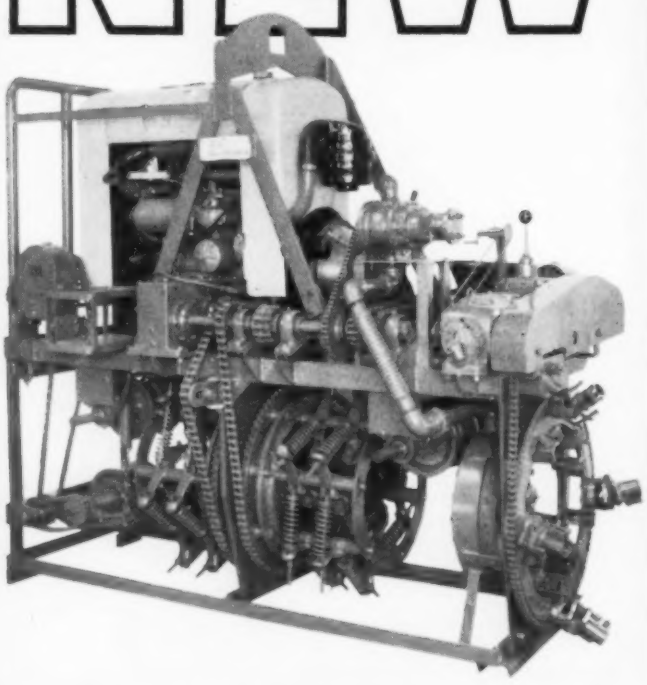
May

Pacific Coast Gas Association, transmission conference, Biltmore Hotel, Santa Barbara, Calif., May 4-5.

NGAA, Permian Basin regional meeting, Lincoln Hotel, Odessa, Texas, May 19.

AGA, Operating Section, Transmission conference, Brown Palace and Cosmopolitan Hotel, Denver, May 25-26.

NEW



CROSE COMBINATION
CLEANING & TAPE WRAPPING MACHINE

AVAILABLE IN FOUR MODELS

The New Crose Combination Cleaning and Tape Wrapping Machine has variable speed tape wrapping head; built-on blower to remove dust from pipe prior to applying tape, and baffles incorporated into machine's design to protect wrapping area from dust. Four models — comparable to the Crose Cleaning and Priming Machine — handle these pipe sizes: 2"-4"; 4"-16"; 16"-32" and 34"-40".

Write Today for Complete Information.

Crose perrault
EQUIPMENT CORP.

2765 DAWSON RD., TULSA, OKLA., Phone WEbster 6-2171 BRANCH OFFICES: Houston, Texas • Elizabeth, New Jersey • IN CANADA: CROSE-PERRAULT CANADA, LTD., Edmonton, Alberta • Toronto, Ontario • EXPORT OFFICE: New York, N. Y.

an ounce of prevention that really PAYS OFF...

UNICOR®

by protecting thousands of square feet of pipeline and refinery equipment

An ounce of prevention is worth a *ton* of cure . . . when it's an ounce of UNICOR.

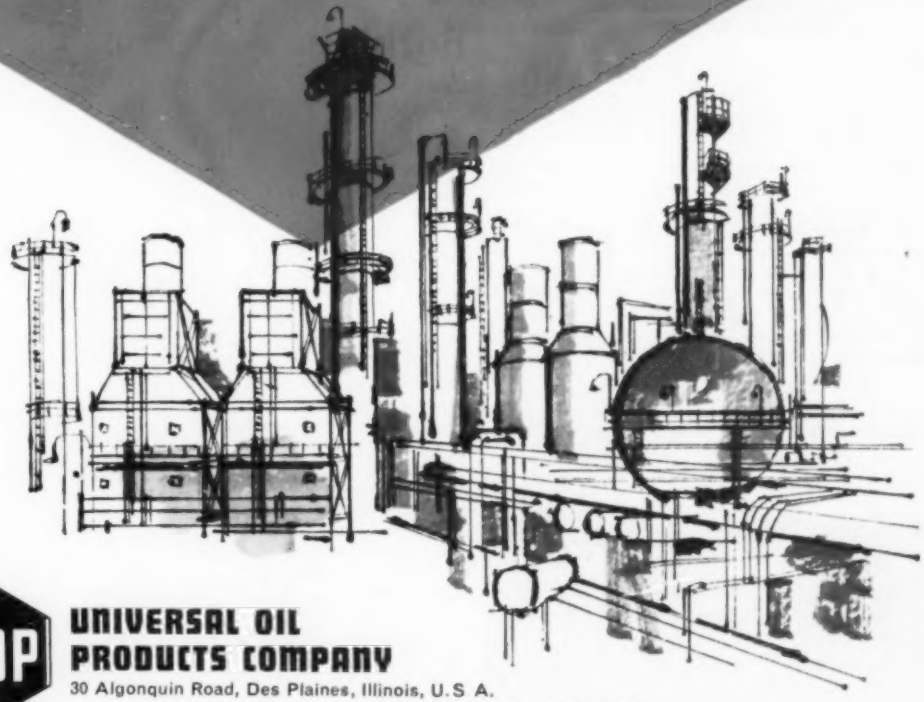
Put 10 to 20 parts of this amazingly potent inhibitor in a million parts of crude or refined petroleum product . . . and see what happens: The UNICOR, an oil-soluble corrosion inhibitor, plates out on inner surfaces of pipeline and refinery vessels and tanks **. . . provides lasting protection against corrosion.**

Added at any point in your operation, UNICOR protects both metal and product, reduces downtime and cost of cleaning and maintenance, assures full flow capacity, keeps power costs at a minimum, safeguards product purity.

Write for information and samples. Address our Products Department.

See our PSE*

Correct selection and most effective use of petroleum inhibitors and additives involves expert analysis and consideration of many factors. As specialists for over a quarter-century, UOP is able to provide unparalleled field service, brought to you by a member of our staff of Product Sales Engineers*. For detailed information on the UOP family of superior inhibitors and additives call or write our Products Department.



UOP®

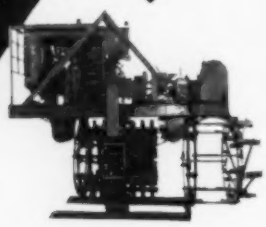
UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road, Des Plaines, Illinois, U.S.A.

WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

MYOCO

CLEANING and PRIMING MACHINES

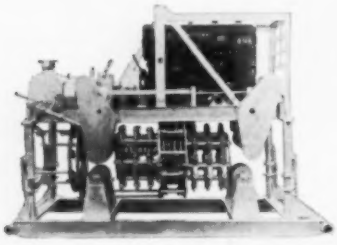


MYOCO MODEL "DR"

Especially designed MYOCO Counter Rotating Heads on this cleaning and priming machine give double cleaning action to pipe.

Seam welds are cleaned thoroughly on both sides.

This fast, dependable unit is powered by an International U-9 self-starting engine using the Ramsey transmission. Engine exhaust is utilized to heat primer tank. Sizes: 3" through 36".



MYOCO CLEANING AND PRIMING MACHINE

Set on a stationary base for yard cleaning this 6-12 Model will clean and prime pipe 3" through 14" diameter plain end.

These machines, like all the equipment at Myoco, can be rented to save you capital, investment and storage costs. Trained, courteous personnel are available 24 hours a day with fast transportation to serve you. Efficient equipment operation is assured by periodical checks. All parts and supplies are shipped the same day, when possible.

Write for our catalog

MORRIS-YOUNG-OWENS CO. PIPELINE EQUIPMENT AND SUPPLIES MYOCO

MORRIS-YOUNG-OWENS CO.

PIPELINE EQUIPMENT AND SUPPLIES

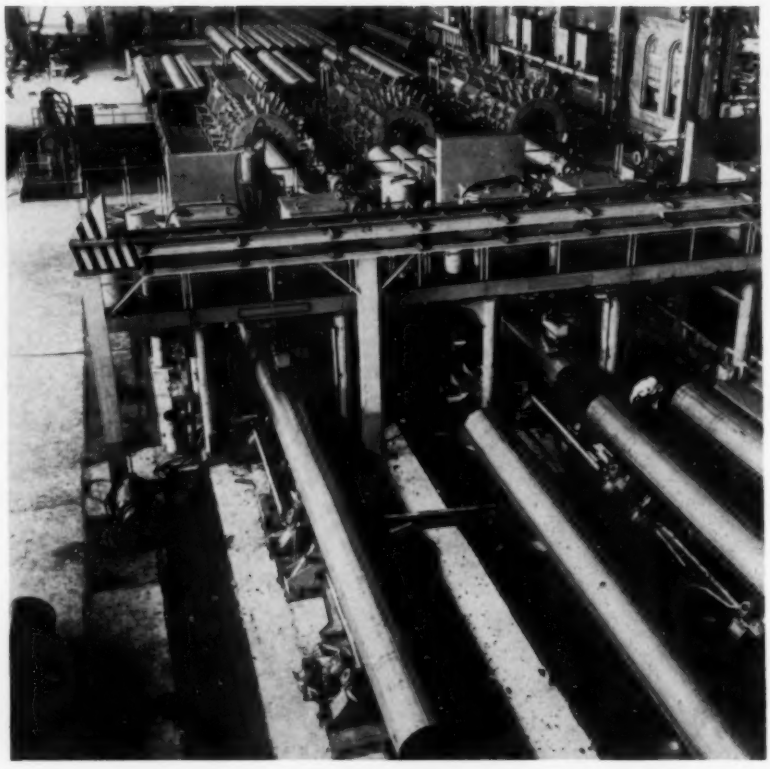
P. O. Box 35137 • Houston 35, Texas

PArkview 3-0110

In Canada: MYOCO LIMITED, Rural Route 1, Midland Ave. N., Agincourt, Ontario, Canada

Tel. WA 2-9444

What's Happening among SERVICE and SUPPLY MEN



Pipe passes through internal and external welding stations at Bethlehem's plant

Bethlehem Opens New Line Pipe Mill

Bethlehem Steel Company has opened its new line pipe mill at Steelton, Pa. The new mill is expected to triple gas pipe production at Steelton. Approximately 25,000 tons of line pipe from 18 to 42 inches can be produced monthly.

Bethlehem has installed at the mill a new 2,500-ton hydraulic U-ing press which transforms a 40-foot length of steel plate, up to ¾-inch thick, into a long "U" in about a minute. Another huge press, an 18,000-ton hydraulic press, takes another minute to turn the "U" into an "O."

Steel plates measuring 40 feet, 5 inches long and 50 to 130 inches wide, depending on desired diameter, arrive by rail at the mill. They are unloaded by gantry crane and delivered to a receiving table just outside the 930-foot-long mill building. A gantry lifts one plate at a time onto the receiving table. Powered rolls then move the plate to the feeding table. The feeding table advances plate to the side planer, which planes each side of steel sheet. The plate is then cut to exact proper size and moved to the U-ing press. After passing through the presses, pipe is welded with an internal bead and external weld applied by tandem submerged electric arc. It is then visually inspected and passed to the expander. Here the pipe is hydrostatically tested. This expands the pipe circumference about 1 to 2 inches and shortens the length about 5 inches. The pipe is enclosed in die clamps and lock bar; a mechanical plug with rubber gaskets seals off ends. The pipe is filled with water and then 50 gallons of high-pressure water is added to expand pipe to the limit of the die clamp. The pipe is then moved to the fluoroscopic inspection station. If no repairs are necessary, joints are moved to beveling station and onto a final visual inspection. Then it is weighed, measured and loaded out for shipping by rail or truck.

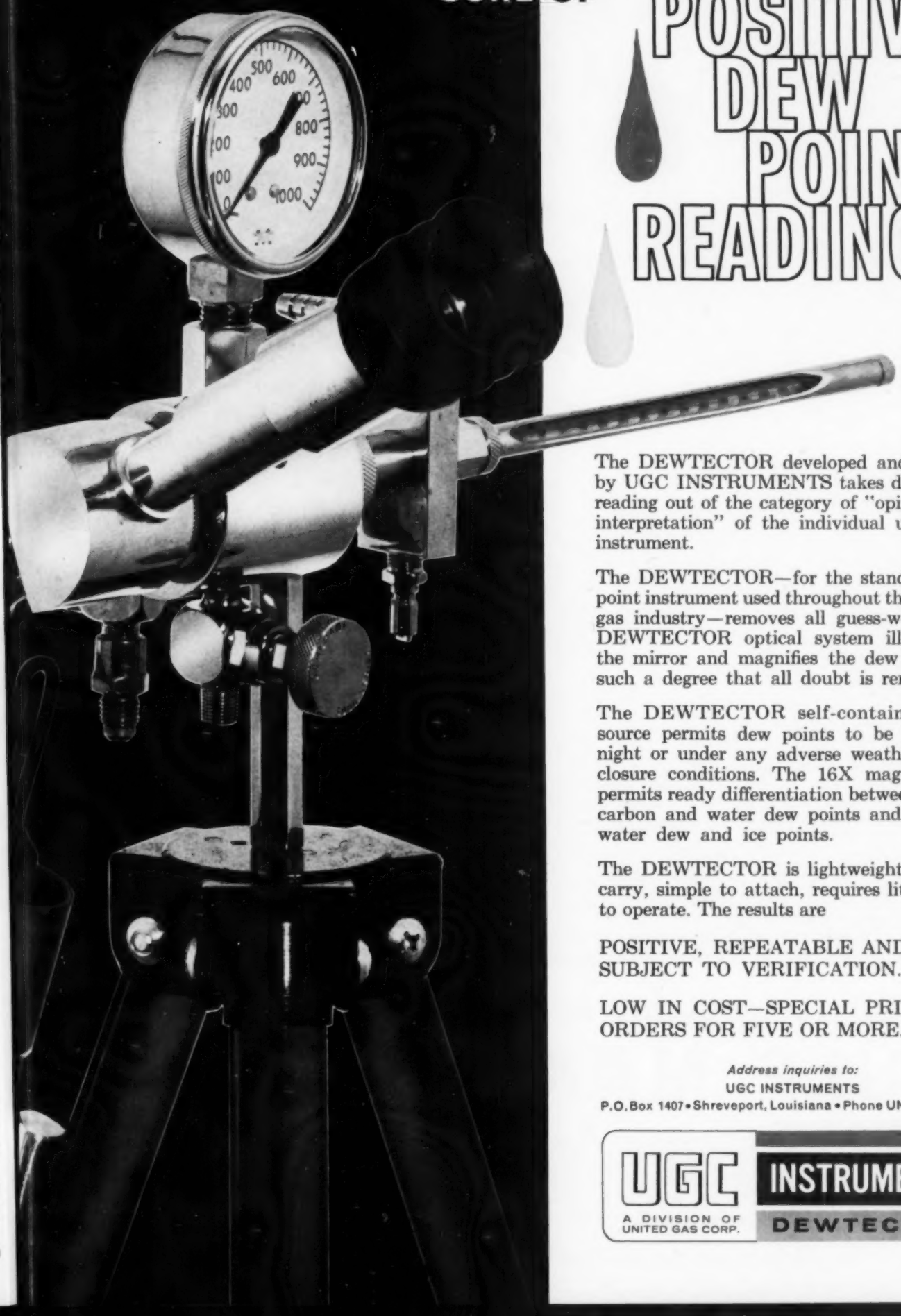
Royston Laboratories, Names Giles Chicago District Manager

Royston Laboratories, Inc., announces the appointment of Thomas G. Giles as Chicago District manager to succeed the late Harry N. Strothman. Illinois, Indiana, Iowa, Wisconsin and Minnesota will be served from the Chicago office.

Giles has been with the company since 1959 in sales and field service in Pennsylvania, West Virginia and the Ohio area.

AT LAST YOU CAN BE SURE OF

POSITIVE DEW POINT READINGS



The DEWTECTOR developed and proved by UGC INSTRUMENTS takes dew point reading out of the category of "opinion and interpretation" of the individual using the instrument.

The DEWTECTOR—for the standard dew point instrument used throughout the natural gas industry—removes all guess-work. The DEWTECTOR optical system illuminates the mirror and magnifies the dew point to such a degree that all doubt is removed.

The DEWTECTOR self-contained light source permits dew points to be taken at night or under any adverse weather or enclosure conditions. The 16X magnification permits ready differentiation between hydrocarbon and water dew points and between water dew and ice points.

The DEWTECTOR is lightweight, easy to carry, simple to attach, requires little effort to operate. The results are

POSITIVE, REPEATABLE AND SUBJECT TO VERIFICATION.

LOW IN COST—SPECIAL PRICES ON ORDERS FOR FIVE OR MORE.

Address inquiries to:

UGC INSTRUMENTS

P.O. Box 1407 • Shreveport, Louisiana • Phone UN 1-4531-LD 81

UGC INSTRUMENTS

A DIVISION OF UNITED GAS CORP.

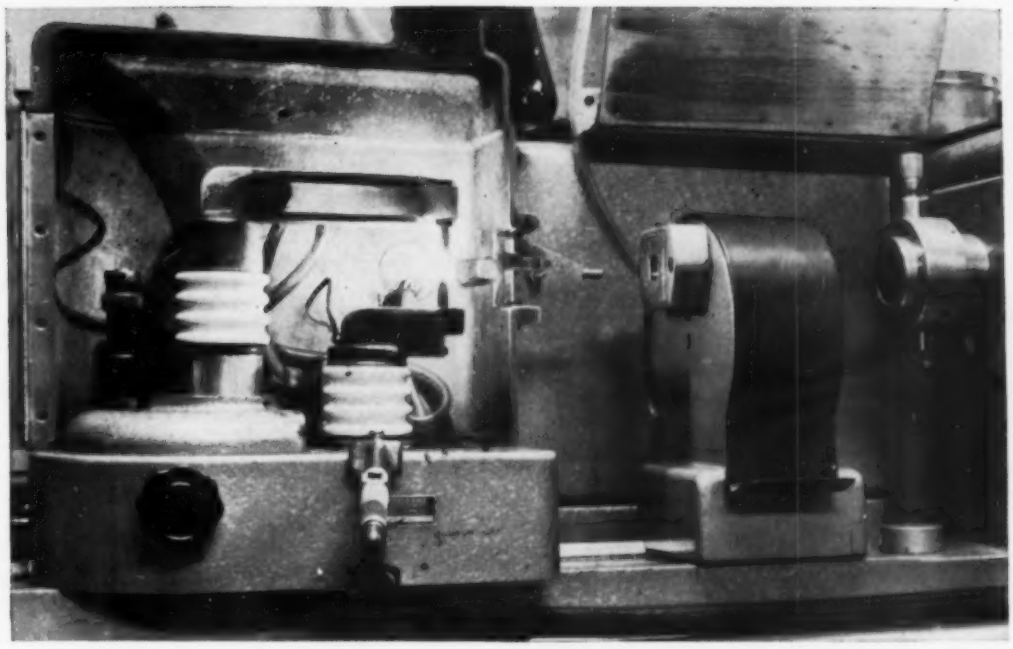
DEWTECTOR

10,125 tests a day assure consistent quality in

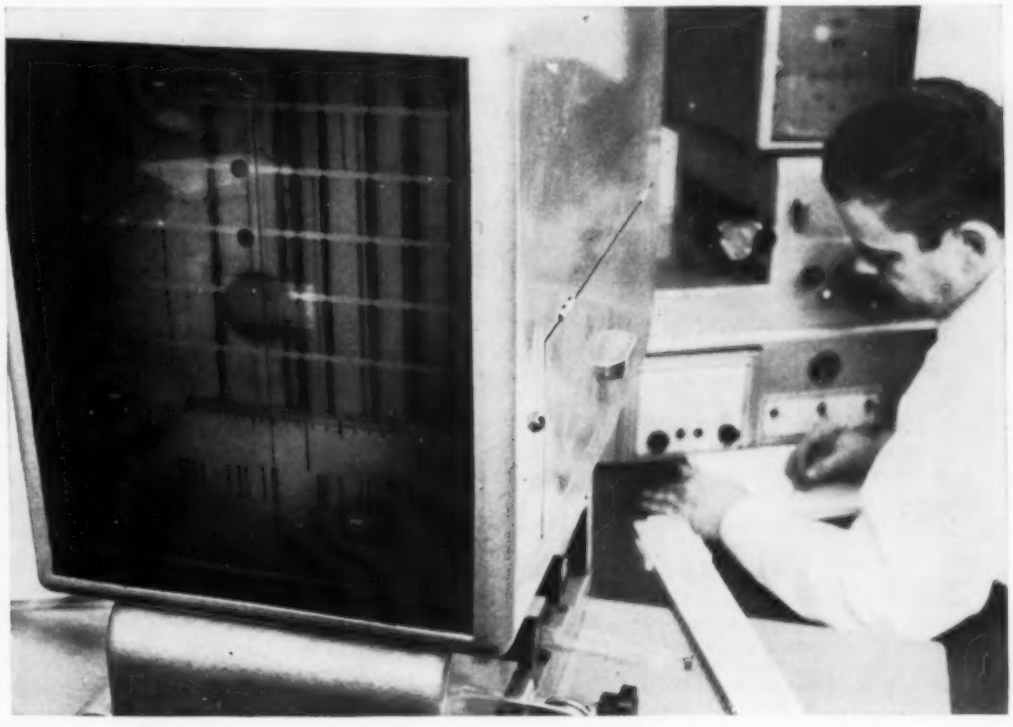
GULF MAKES THINGS

These bottles contain samples of a variety of Gulf fuels and lubricants. Each has been subjected to a series of quality control tests at Gulf laboratories. Any one of the tags shown might carry the "pedigree" of a Gulf product for a drilling rig or a pipeline pumping station.

Product purity is policed constantly at Gulf. During the refining process, samples from *every* lot of Gulf gasoline, diesel fuel, lubricating oil and grease are tested and re-tested to make sure that formulations are exact and that impurities are essentially eliminated. For ex-



Emission Spectrograph (above) causes undesirable elements in a petroleum sample to emit their characteristic light spectrum which is photographed on a strip of film. In the Densitometer (below) the spectrum on the film is evaluated to identify the presence of metal contaminants down to less than one part per million.



every Gulf® product . . .

RUN BETTER!

ample, Gulfcrest® 44, world's leading turbine oil, is quality-controlled to limit contamination to less than one part per million.

A continuing program of quality control tests is one of the reasons we say: Gulf Makes Things Run Better!

GULF OIL CORPORATION
Department DM, Gulf Building
Houston 1, Texas

GULF®

For more data on advertised products, use Readers' Service Cards, last page.

C. C. Sublett Purchases Greenhead Sling Firm

C. C. Sublett and a group of associates have bought the assets of Greenhead Sling and Supply Company. The new company will operate under the name of Greenhead, Inc.

Sublett will continue to operate his own pipe sales office in the San Jacinto Building in Houston. Dan Otto, formerly with Associated Oil & Gas, will be manager of Greenhead, Inc. He has over 20 years experience in the drilling and production end of the oil industry.

Hydromatics Names Sales Manager and Chief Engineer

John A. Wiedmann has been appointed chief engineer and Jack W. Harris becomes industrial sales manager for Hydromatics, Inc. Wiedmann had been chief design engineer for Minneapolis-Honeywell Missile Equipment Division and most recently section head of design engineering for Honeywell Valve Division.

Harris comes to Hydromatics from Rockwell Manufacturing Company where he was assistant product manager, Nordstrom Valve Division. Previously he was sales engineer for Rockwell in Houston.

White Diesel Engine Appoints Lou C. Michie Representative

Lou C. Michie recently joined White Diesel Engine Division of White Motor Company as sales representative covering the St. Louis and Chicago areas. Lou will be headquartered in St. Louis. He has been associated with the business for the past 20 years with most of the service in the Midwest.

Worthington Corporation Names Frank J. Nunlist Vice President

Frank J. Nunlist has been named vice president-operations of Worthington Corporation. In his new position, Nunlist will be responsible for activities of all the company's 16 domestic operating divisions in 10 states and regional engineering and service activities.

F. J. Nunlist

He became associated with Worthington when the company acquired the L. J. Mueller Furnace Company in 1954. He became executive vice president of the Worthington Mueller Climatrol Division and was elected group vice president of Worthington Corp. in 1958.

Atlas Pipe Inc., Enlarges Facilities at Corpus Christi

Atlas Pipe Inc., a division of Atlas Bradford Company, has expanded its facilities for serving the industry of South Texas by moving its Corpus Christi shops and yard to larger site, 15 acres, on Up River Road. A new office building as well as shop and pipe storage facilities are at the new site.

The shop has machines for handling tubing and pipe from 1 to 13⅜-inch. In addition, the shop is equipped for cleaning, straightening and testing tubular products by hydrostatic pressure. Portable equipment for providing these services in the field are maintained in Corpus.

Walworth Company Appoints Dr. Monkman Vice President

Walworth Company has announced the appointment of Dr. Forest C. Monkman as vice president, research and engineering. Dr. Monkman joined Walworth in 1955 as research director. Previously he had managed the technical, sales and business aspects for a materials laboratory, which specialized in testing and developing high pressure alloys.

Helmerich & Payne Buys Natural Gas Odorizing Co.

Helmerich & Payne, Inc., Tulsa, has purchased Natural Gas Odorizing, Inc., a Houston firm which manufactures odorants for gas transmission and distribution industry.

Helmerich & Payne is in the drilling contract business. Natural Gas Odorizing was founded in the early 1940s.

Geigher Pipe Supply Stocks Alloy Steel Products Valves

Geigher Pipe Supply Company has been appointed stocking distributor for Alloy Steel Products Co. corrosion resistant valves. Geigher's warehouse facilities will now make available to their customers in the central states area a stock of Aloyco's valves, plus extensive technical advisory service and engineering development facilities.

Geigher Pipe Supply is actively operated by four partners who founded the business in 1950. Charles Geigher, George J. Humphreys, Robert J. Kligman and Harvey Twellman started the firm.

GET MORE SPEED
...MORE DEPENDABILITY

with the original
VERTICAL PIPE BENDER

• Fastest bending machine on any spread. C-R-C's reversing clutch gives equal speeds forward and reverse.

• No flattening or egging of pipe. For smooth, wrinkle-free bends on the strongest pipe made . . . the C-R-C Bender is your best buy.

• Cable operated for dependable performance, economical maintenance.

• The C-R-C Model "B" Bender is under eight feet wide on tires or tracks.

For full details and specifications write or call:

SERVING PIPELINERS • SINCE 1933 •

CRC

CRUTCHER · ROLFS · CUMMINGS, INC.

Home Office: Houston, Texas, Box 2073, OVerland 6-4301

Export Office: International Oil Equipment Co., 30 Rockefeller Plaza, New York, N. Y., COlumbus 5-6250
In Canada: Canadian Equipment Sales & Service Co., Ltd., 7310 99th St., Edmonton, Alberta, Canada

. . . in stock and ready for delivery from CURTIN

NEW ASTM SHORT CONE SHAPE BS&W TUBE

W. H. Curtin & Company has on hand complete stocks to fill your requirements in converting to the new Short Cone Shape BS&W Tube approved at the June 1960 meeting of ASTM Committee D-2. Standard ASTM 100-ml tubes or tubes graduated in 200 parts, hand and motor-driven centrifuges, plus all accessories needed for converting your present equipment are available at all Curtin locations. Curtin Bulletin CT-660-1 shows exactly what is required to convert each type of centrifuge now in use. **Ask your Curtin salesman or write W. H. Curtin & Co., Box 118, Houston 1, Texas.**

W. H. CURTIN & CO.

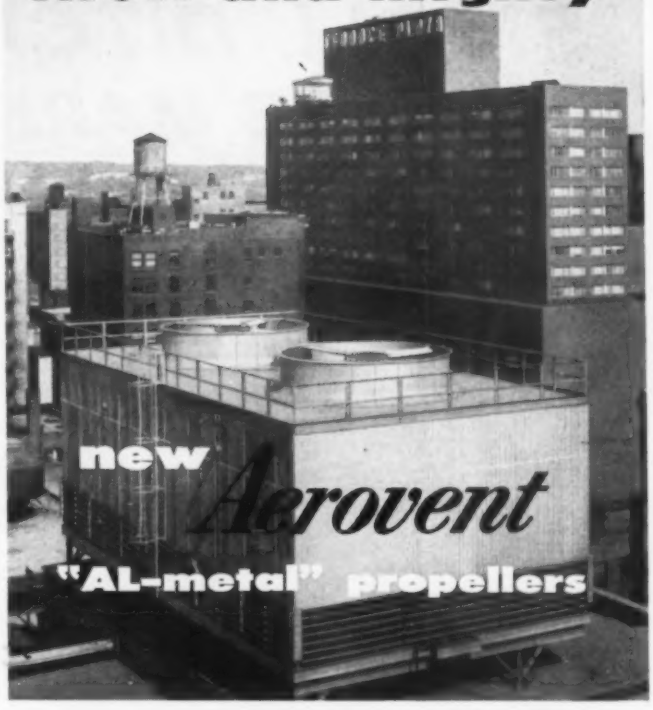
CURTIN

PETROLEUM TESTING EQUIPMENT

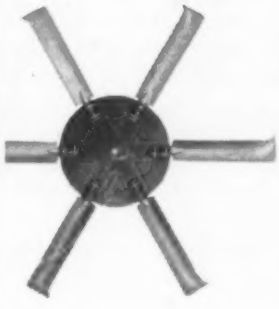
HOUSTON • DALLAS • TULSA • NEW ORLEANS
JACKSONVILLE • BIRMINGHAM • CORPUS CHRISTI
CURTIN DE MEXICO, S. A. DE C. V., MEXICO, D. F.

110

"HIGH and mighty"



move mountains - of AIR!
in towers and exchangers



- Sizes 14' to 18'
- 4 or 6 blades

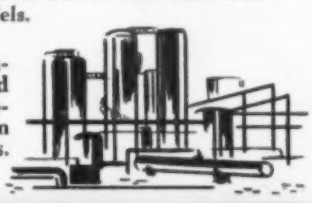
Developed originally for the petroleum industry, Aerovent Large-Diameter "Al-metal" Propellers, constructed of tough, durable aluminum alloy, move great quantities of air at high velocities, in heat exchangers and cooling towers. Pictured above are two 4-blade, 16-ft. propellers in a cooling tower installation. These mighty propellers, with adjustable-pitch "Macheta" Airfoil blades, are job-engineered to individual specifications.

Write for free Bulletin 510

DESIGNED FOR DEPENDABLE OPERATION!

Endurance tests, conducted at *3 times* normal loading prove the ability of these new large-diameter propellers to withstand severe punishment. Heavy-duty cast steel hubs offer maximum resistance to stresses. Angle settings for each operating requirement, and appropriate alternate settings, assure accurate pitch for any predetermined performance which may be required. 54" to 144" now available in Adjustable Pitch Models.

REFINERIES, pumping stations, industrial plants and commercial buildings use Aerovent "Al-metal" Propellers in major air-moving applications.



Aerovent FAN COMPANY, INC.

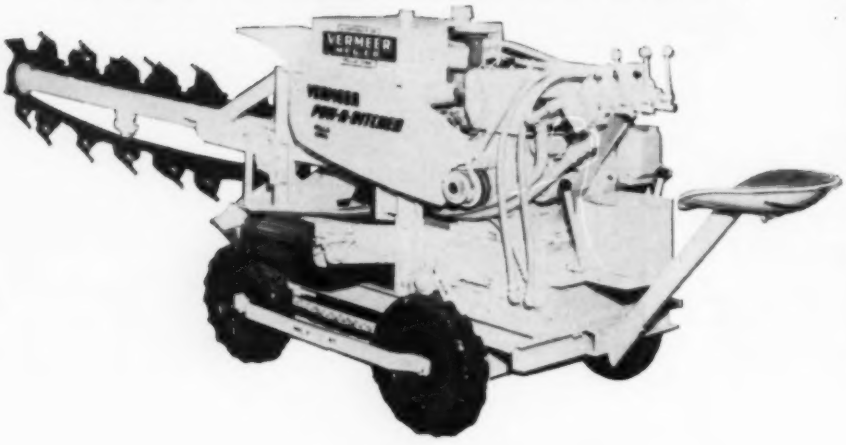
LARGE PROPELLER DIVISION

304 Wright Bldg.
TULSA 3, OKLA.

Main Office and Factory
PIQUA, OHIO

For more data on advertised products, use Readers' Service Cards, last page.

NOW...THE NEWEST, FASTEST SMALL DITCHER ON THE MARKET



VERMEER'S NEW MODEL W-3 POW-R-DITCHER

Designed Especially For Gas and Electrical Service . . . and Shallow Water Lines

Looking for a rugged, fast, powerful **small ditcher** that will really work? Vermeer's small-but-mighty W-3 Pow-R-Ditcher will fill the bill . . . an ideal unit for contractors, municipalities, utilities and custom operators. The W-3 is available with rubber-tired wheels or crawler tracks and features a completely hydraulic drive system. No gear shifting. An adjustable rubber belt conveyor deposits dirt on either side of ditch. If you are looking for a faster, easy-to-operate multi-purpose small ditcher, mail the coupon. Demonstrations are being scheduled now in all sections of the country. We will be happy to demonstrate the W-3 for you at your convenience.

EQUIPPED WITH 18 H. P. ENGINE

- Digs 3" to 12" wide at 1' to 10' per minute — down to 4' deep
- Equipped with transport speed
- Heavy chain, boom and frame
- Has separate hydraulic motor for each set of wheels
- Completely hydraulic drive
- Available with wheels or tracks

MAIL COUPON FOR COMPLETE ILLUSTRATED LITERATURE AND LOW PRICES

Please send complete information and low price of new W-3 Pow-R-Ditcher.

Name.....

Title or Dept.....

Address.....

City..... State.....

☐ Check here for FREE W-3 demonstration in your area.

VERMEER MANUFACTURING COMPANY
1403 West Washington • Pella, Iowa

R. D. Schuler

M. J. Kauffman

Fischer & Porter Fills Three Executive Positions

Three executive appointments have been made by Fischer & Porter Company. Lawrence R. Greenhaus becomes general sales manager; Reginald D. Schuler was named director of technology, and Manuel J. Kauffman has been named to the new post of manager of Flowmeter Division.

L. R. Greenhaus

Greenhaus, who will coordinate company sales of process instrumentation, chlorination equipment, data reduction systems and laboratory glassware, formerly was with Luria Engineering Company. Schuler will be in charge of all engineering and research operations. Kauffman will coordinate sales of Fischer's varied flowmeter line.

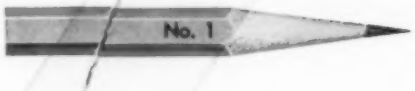
Four Promotions Announced By Fairbanks, Morse & Co.

The appointments of four men to top positions at the pump and hydraulic division of Fairbanks, Morse & Co. recently was announced. Advancing to director of marketing at division headquarters in Kansas City, Kan., is William F. Wahlenmaier, formerly assistant to the company-wide director of marketing in Chicago.

Plant manager appointments stem from the vacancy created when Chris E. Clausen was promoted from manufacturing manager to general manager of the Scale Division in Fair Lawn, N. J. Appointments include C. Harold Johnson, manager of Kansas City Works; W. Paul McAnally, manager of the Stuttgart, Ark., Works, and T. Ray Mackay, manager of the Pomona, Calif., Works.

Johnson had been manager at Stuttgart and McAnally was manager at Pomona, while Mackay had been division director of engineering at Kansas City.

Erase Your Pipeline Protection Problems with this Four-Point PITT CHEM Enamel Program!



COMPLETE QUALITY CONTROL

As a basic producer, Pittsburgh maintains rigid quality control standards at every step of enamel production, from coal to finished coating—your guarantee of consistently superior quality. Today, *Pitt Chem* Pipeline Enamels protect thousands of miles of gas and petroleum product transmission and distribution lines from coast to coast!

WRITTEN SPECIFICATIONS

Published to assure you uniform top quality and performance from every drum of *Pitt Chem* Pipeline Enamels—in application and in service.

EXPERIENCED SALES SERVICE

Pitt Chem sales representatives are experienced coating men. They talk your language, will help you plan the many requirements of your coating job.

TECHNICAL FIELD SERVICE

Pittsburgh maintains a full time staff of field service men to work with your field men in the efficient, economical application of coatings. *Write us about your protection requirements!*

- PITT CHEM® Coal Tar Pipeline Enamels
- PITT CHEM "Insul-Mastic"® Gilsonite-Asphalt Coatings
- PITT CHEM "Tarset"® Coal Tar-Epoxy Resin Coatings
- PITT CHEM "Tarmastic"® Coal Tar Coatings

PROTECTIVE COATINGS DIVISION

PITTSBURGH CHEMICAL CO.

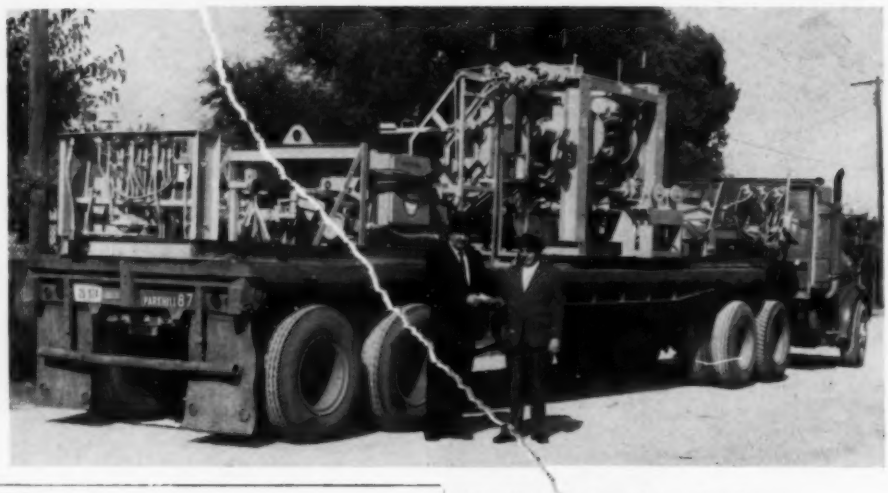
GRANT BUILDING PITTSBURGH 19, PA.

A Subsidiary of PITTSBURGH COKE & CHEMICAL CO.

1194

Coating-Wrapping Equipment

R. C. Stanley, vice president Stanley-Bledsoe Corp., and John Brand, vice president Crose-Perrault Equipment Corp., discuss Pacific Gas Transmission Co. gas line construction. Stanley-Bledsoe will handle double jointing, coating and wrapping at railhead yards. The line is part of the 1,400-mile, 26-36-inch Canada to near San Francisco project. Three new Crose-Perrault coating and wrapping machines will be used by Stanley-Bledsoe.



MID-AMERICA

BUILDS FOR ENDURANCE

Mid-America Pipeline Company's new line will carry LPG all the way from the West Texas and New Mexico area to Minnesota and Wisconsin—2,200 miles of pipe. A big job of construction. Big investment in money too! Pipelines must be built to last.

That's why Reilly Intermediate Enamel with Q. D. Primer, were specified as coatings for a portion of the Mid-America system to lend lifelong protection against corrosion to the new line. Coal Tar Enamels are the engineering materials of choice where endurance of protection against corrosion is a design requirement.

Reilly COAL TAR PRODUCTS

ARMED Protective Coatings

REILLY TAR & CHEMICAL CORP.

1615 MERCHANTS BANK BUILDING
INDIANAPOLIS 4, INDIANA

Nordberg Appoints Engineers To Cleveland Sales District

George J. Wooldridge has been appointed sales engineer and Alden G. Wiedenhoefer service engineer under Philip Wallach, district sales manager of Cleveland, Ohio, for Nordberg Mfg. Co.

Wooldridge has been with the company since 1956, and Wiedenhoefer joined the company in 1935.

Solar Aircraft Names Pitt Vice President

Paul A. Pitt has been named a vice president of Solar Aircraft Company, a subsidiary of International Harvester Company. Sumner Alpert has been named manager of a new division which includes Solar's aerospace, ground support and industrial products. Pitt has been the company's chief engineer since 1955. He joined the company in 1942, and led the development of Solar's gas turbines, controls and turbomachinery. Alpert has been with the firm since 1951.

Wickersham and Company Represents Daniel Orifice Fitting Company

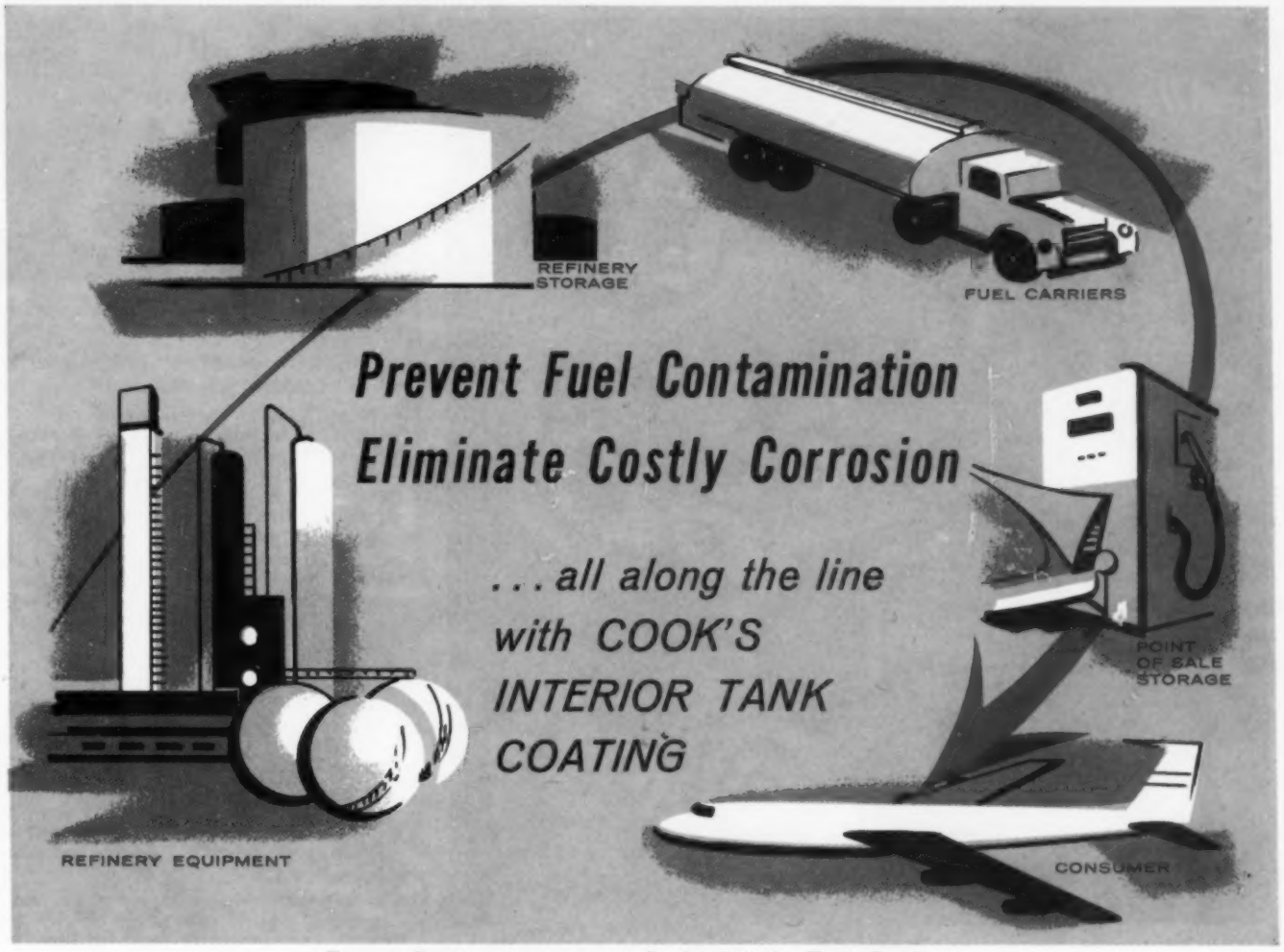
Daniel Orifice Fitting Company has named William B. Wickersham and Company executive sales representative in New England. Wickersham will handle sales and service of Daniel products for flow measurement in Maine, New Hampshire, Vermont, Connecticut, Rhode Island and Massachussets, except for Berkshire County. Headquarters for Wickersham is 1449 Washington Street, West Newton, Mass.

William B. Wickersham heads his own company and is assisted by Lawton Bourn.

Dresser Industries Creates New Electronics Organization

Dresser Industries, Inc., has established a new division to give better identification to the company's expansion in the electronics industry. The scope of the new division, Dresser Electronics, will include all the activity in the electronics field of two Dresser subsidiaries, Southwestern Industrial Electronics Co., and Hermetic Seal Transformer Division. The names of these companies will be modified to show their relationship as divisions of Dresser Electronics.

Southwestern Industrial Electronics will be changed to Dresser Electronics, SIE Division, with George Peck continuing as president. Hermetic Seal will become Dresser Electronics, HST Division, with Peter L. Scott remaining president.



From refinery to consumer...Cook's Interior Tank Coating protects gasoline, aviation or jet fuels from contamination.

From refinery to consumer, uncontrolled internal corrosion adds tremendous costs to storage and transportation operations every year. With over seven years of proved performance in the field, Cook's internal tank coatings have shown that they stop this vast waste . . . and at the same time provide positive protection against contamination of stored refined petroleum products.

Published data shows that corrosion may consume up to 20 mils per year from the interior of some uncoated product tanks. Every particle of a corrosion product contaminates the fuels and solvents, sold to consumers. What contamination of aviation gasolines and jet fuels . . . a result of corrosion . . . may cost refiners in reputation is incalculable.

You risk neither corroded equipment nor dirty fuel when you corrosion-proof the inside of refinery, transportation and storage equipment with Cook's Interior Tank Coating. You also meet the lining requirements as set forth by Specification MIL-C-4556-A, Fuel and Water Resistant Coating.

Tests of several interior tank coatings by a leading refiner indicated . . .

1. Only Cook's, and two others, met the refiner's anti-corrosion specifications.
2. Among these three leaders, Cook's-coated tanks showed less corrosion than the other two.

Cook's Interior Tank Coating saves refiners labor, time, and money in important additional ways. It is normally applied in two coats. Its heavy body lends itself to uniform application to a total of 5 to 6 mils thickness—the minimum thickness for best protection.

Cook's Coating will withstand "steaming." There is no need to recoat inside surfaces after this cleaning operation.

A film of Cook's Interior Coating will protect inner walls from the corrosive action of salt and fresh water, as well as crude oil and most other petroleum products.

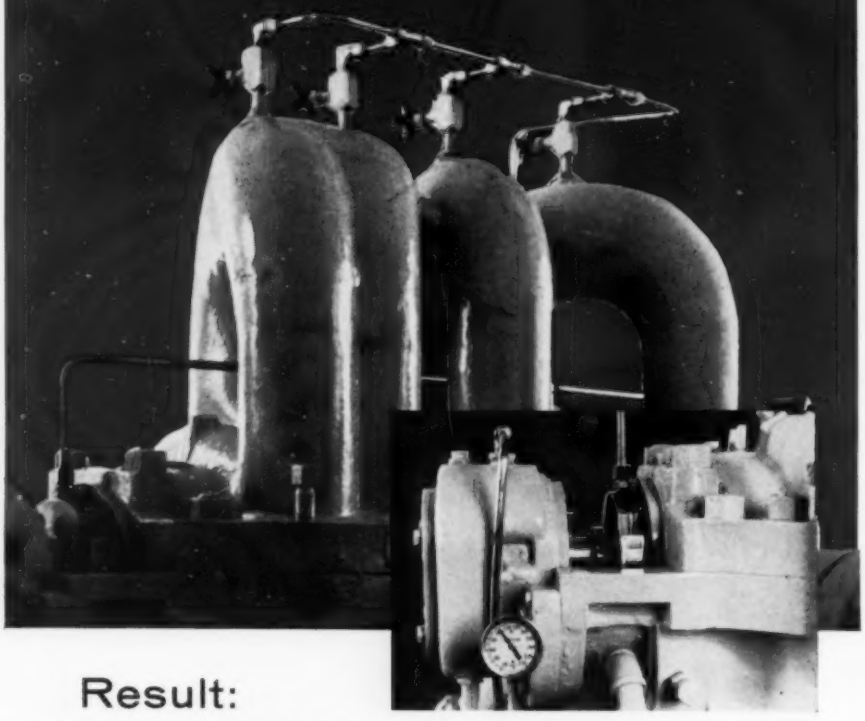
Cook's service is as dependable as Cook's products. Our experienced engineers will be glad to help analyze and recommend solutions for your own coating problem. Interior Tank Coating is only one of several related finishes and protective products offered by Cook's Paints. If you have a problem, we suggest you contact us *now*. For more complete information, apply to the headquarters of Cook's Paints nearest you. Addresses are listed below.

COOK'S PAINTS

COOK PAINT & VARNISH COMPANY

KANSAS CITY, MO.	HOUSTON, TEXAS	DETROIT
P. O. Box 389	P. O. Box 3088	P. O. Box 5507
GRand 1-4800	CApitol 8-2391	UNiversity 1-1000
Teletype No. 584	Teletype HO29	Teletype DE293

*Atlantic Pipeline standardizes on Borg-Warner Mechanical Seals with exclusive "Pre-setting Ring"**

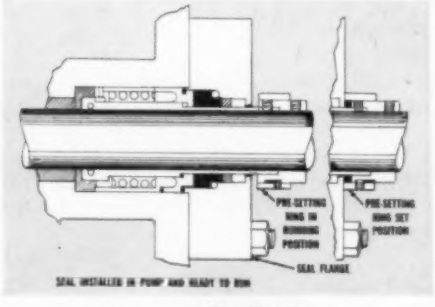


Result:
Up to 50% less maintenance

Since their first installation over four years ago, Atlantic Pipeline Company's Eastern Division has standardized on Borg-Warner Mechanical Seals on main line, booster and calibrating pumps. To date, experience with 26 pumps shows up to 50% less frequent maintenance; a marked decrease in product losses through leakage and evaporation; reduction of hazardous fumes; plus the economy of standard, interchangeable seals. Seals at Atlantic Pipeline's Product System operate under all conditions from inches of vacuum to 1300 psi, with *no pump down time due to seal failure!*

Here's how it works:

Complete Seal unit slips onto shaft—bolts to the stuffingbox. Pre-setting ring is then locked in running position to assure perfect spring tension.



*Pat. Pending

Borg-Warner Mechanical Seals

DIVISION OF BORG-WARNER CORPORATION

P.O. Box 2017, Terminal Annex, Los Angeles 54, California

A. O. Dietrich

C. W. Bowden, Jr.

Minneapolis-Honeywell Promotes C. W. Bowden, Jr., and A. O. Dietrich

Minneapolis-Honeywell Regulator Company has announced the promotion of Charles W. Bowden, Jr., to industrial sales manager of its International Division and Arthur O. Dietrich to succeed him as advertising and sales promotion manager.

Bowden fills a new post created to facilitate expansion of overseas markets. He will be based in Philadelphia. Bowden, who has served as an industry engineer and as an industry manager, joined the company in 1946. He became manager of advertising and sales in 1954. Deitrich joined Honeywell in 1948.

Cooper-Bessemer Appoints Boyum, Salls Sales Managers

David Salls has been appointed manager of gas industry sales and William B. Boyum has been named manager of gas turbine sales for The Cooper-Bessemer Corporation.

Salls formerly was manager of the company's gas turbine sales. Prior to that he directed the company's effort in gas pipe line projects. Boyum has had 10 years experience in this field. He was responsible for new products and new markets for the Cryogenic Machinery Division of Air Products, Inc., and Dynamic Research, Inc., before joining Cooper-Bessemer.

Rockwell Names Bush Sales Vice President

Roy R. Bush, midwestern regional manager, has been elected a sales vice president of Rockwell Manufacturing Company's Meter & Valve Division. Bush joined the company in 1934 as a sales engineer and in 1954 was appointed midwestern regional manager. He will be located in Pittsburgh.

CLASSIFIED ADVERTISING

PIPE

SPOT—NEW YORK, N. Y.

Black, Electric Resistance Welded Steel Pipe, Double Random Lengths, Plain Ends, Beveled for Welding, API Specification 5L, Grade B, Moody Inspected and Certified.

8⅝" O.D. x .322 Wall—28.55 lbs/ft
10¾" O.D. x .250 Wall—28.04 lbs/ft
14" O.D. x .250 Wall—36.71 lbs/ft
14" O.D. x .312 Wall—45.68 lbs/ft
14" O.D. x .375 Wall—54.57 lbs/ft

HUGO NEU CORPORATION
45 Nassau St., New York 5, N. Y.
Tel—REctor 2-1334

THE S. D. DAY COMPANY

MANUFACTURER'S
REPRESENTATIVE FOR:

PITTSBURGH COKE & CHEMICAL CO.
Pitt Chem Hot Applied Enamels
Pitt Chem Cold Applied Coatings including Tarset

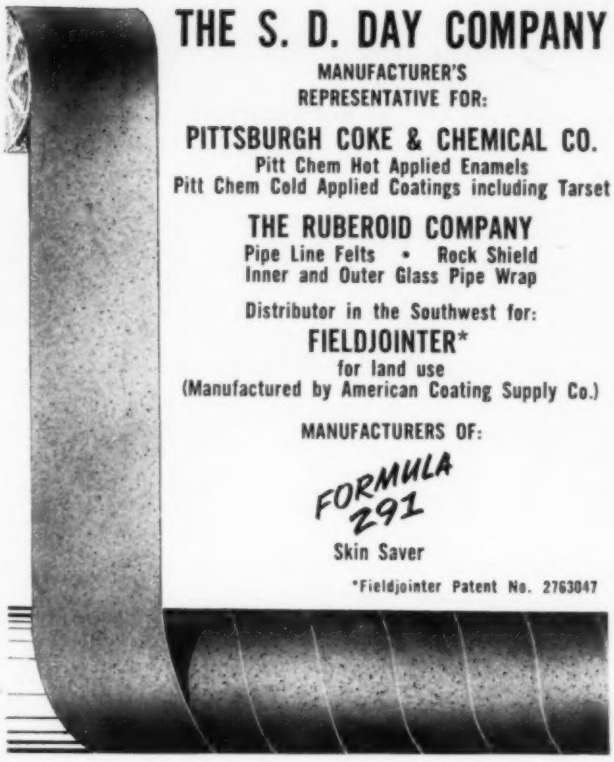
THE RUBEROID COMPANY
Pipe Line Felts • Rock Shield
Inner and Outer Glass Pipe Wrap

Distributor in the Southwest for:
FIELDJOINTER*
for land use
(Manufactured by American Coating Supply Co.)

MANUFACTURERS OF:

FORMULA 291
Skin Saver

*Fieldjointer Patent No. 2763047



"serving all pipelines"

S. D. DAY COMPANY
3115 BUFFALO DR., HOUSTON 19, TEXAS
PHONE JA 8-2431

OIL / GAS
WATER
PRODUCTS
PIPELINE SYSTEMS

WILLIAMS BROTHERS

ENGINEERS - CONSTRUCTORS

NBT BUILDING, TULSA, OKLAHOMA / CABLE: WILLBRO

NEW YORK / WASHINGTON / LOUISVILLE
MINNEAPOLIS / CARACAS / BOGOTA / LA PAZ / EDMONTON
CALGARY / LONDON / ANKARA / TEHRAN

As SIMPLE and Dependable as the Pull of a MAGNET!

A sleeve, raised and lowered within a non-magnetic tube, attracts or releases an Alnico magnet attached to a mercury switch. Basically, this is Magnetrol.

MAGNETROL

The Simplest, Most Versatile LIQUID LEVEL CONTROL Ever Devised!

Linked to liquid level by infallible magnetic force, Magnetrol is free from the limitations inherent in mechanical or electrical controls. With the actuating magnet rated at 98% of initial strength after 30 years, Magnetrol has *infinite operating life,* with practically no maintenance at all. There are no wearing parts to get out of order.

What's more, Magnetrol's simple operating principle permits easy, economical modification of standard units to meet *any* pressure, temperature or corrosion requirements. That's why there's practically no limit to Magnetrol's use. It's also why "specials" are likely to be standard with us. Magnetrol units control level changes from .0025-in. to 150-ft. —with single or multi-stage switching.

MAGNETROL, Inc.

● *SEND COUPON FOR DETAILS*

MAGNETROL, Inc., 5328 Belmont Road, Downers Grove, Ill.
Please send me catalog data and full information on Magnetrol Liquid Level Controls.

Name_____
Company_____
Address_____
City_____ Zone____ State____

Here's why a GROVE G-5 never needs maintenance

The big reason you can hook up a Grove G-5 and forget it is the famed Grove full opening "big valve" design. You get (1) precision ground, chrome plated and polished side plates for positive metal to metal seal, backed by (2) proven Grove protected Seal-O-Rings on both sides of the gate, for (3) up and down stream seal. Because the Seal-O-Rings are on the gate (4), they are out of the flow at all times, protected from damage caused by contaminates in the bore.

The big plus feature — Grove G-5 valves never need lubrication. Grove series 150 G-5 valves are available in lever or handwheel operated models, sizes 2" through 36".

GROVE VALVES

GROVE VALVE and REGULATOR COMPANY

A Subsidiary of Walworth

66th and Hollis Street, Oakland 8, California

Houston • Los Angeles • Odessa • Tulsa • Denver • Chicago
New York • Dallas • Pittsburgh • Farmington, N. M.
Lafayette, La. • Harvey, La. • Longview, Texas
In Western Canada: Grove Valve Ltd., Edmonton

6278

What's New in EQUIPMENT

Positioning Control

Hanna Engineering Works has developed a new electrical mechanical servo device called Hanna-Powr Positioner which automatically positions valves, tools, etc. It is used in conjunction with various types of power mechanisms such as an air or hydraulic cylinder, along with solenoid valves on pipe lines.

By turning or pressing the position selector control switch in the pipe line office, the valve will be opened or closed at any of several selected positions. A return readout signal light indicates when the predetermined position of the pipe line valve has been achieved. The positioner Model PR2A has two cam rods and a connecting link on one end is attached to the mechanism the positioner is controlling.

This positioner can also be used with a two-directional motor in conjunction with a reversing relay to operate many different types of devices.

For more data, circle **No. E1** on Readers' Service Card, last page this issue.

Coal Tar Tape

A coal tar protective coating in tape form has been developed by Tapecoat Company. The product is hot-applied with the use of a torch and designed for single-thickness application following standard priming.

The tape consists of a high-tensile-strength fabric completely saturated with coal tar pitch to provide a compatible base for the more pliable coal tar coating material on the tape.

The tape includes a tough polyester film imbedded in the side of the tape not in contact with the pipe. Thus, when spiral wrapping is completed the film becomes an outer wrap and provides extra reinforcement for the protection against impact, soil stress and abrasive conditions. The film also serves as a separator in the roll.

(This item supplements Tapecoat Co. data on page 451 of the Pipe Line Catalog, Third Revision.)

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

Antistatic Agent

A new antistatic agent known as Sonostat 60, which imparts a high degree of static inhibition at low cost to all types of wool, synthetic textiles and other substrates, was announced by Sonneborn Chemical and Refining Corporation.

Sonostat 60 is a 100 percent active, nonionic liquid that is readily emulsifiable. It is amber in color and contains no mineral oil. The product is stable toward oxidation, discoloration, or odor development and will not corrode equipment. It scours readily and will assist in the removal of spinning lubricants that may be present on the stock, according to Sonneborn.

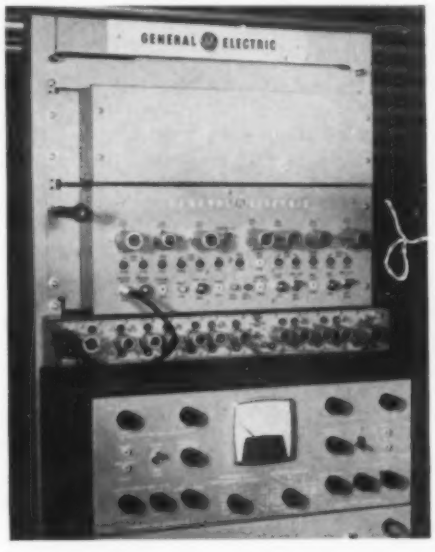
For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Utility Pump

An electric utility pump for petroleum products has been introduced as the Series 57 by the Bennett Pump Division of John Wood Company. The new pump, for gasoline, kerosene, diesel fuel and other fluids, has been enginered for use for a wide variety of installations, such as industrial and construction sites. It is lightweight, easily installed and is capable of delivering approximately 12 gallons per minute.

Belts and gears have been eliminated to provide a direct-drive pumping unit, permanently lubricated, with a minimum of moving parts.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.



Microwave Radio System

General Electric Communication Products Department has introduced a new microwave radio system, Type UA-6B, accommodating up to 240 voice channels, for point-to-point communication. The new equipment operates over the range of 5925-7450 mc.

Integral "control" center test facilities permit metering of all critical voltages and currents, including RF power monitoring and control of stations without removal of covers.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.

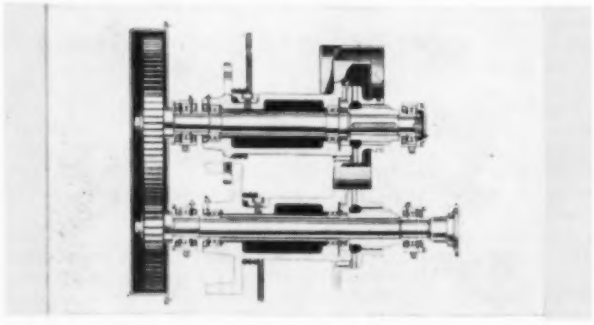
Compare These Capacity-Adding, Service-Saving Advantages

found only in International Superior Sidebooms...

Only the International Superior TD-25 Sideboom offers the advantages of Planet Power "live" track-steering, and on-the-go Hi-Lo power-shifting. No clutch-steered rig can match TD-25 pipe handling maneuverability. The "25" boom lifts 130,000 lbs. at 4 ft. overhang—features a new 35 gpm, front-mounted accessible hydraulic system.

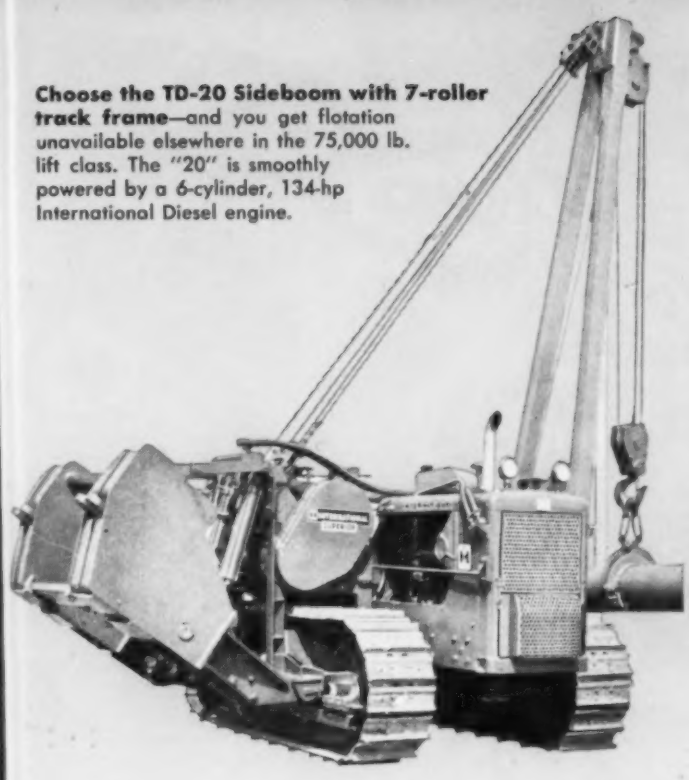
Match key International Superior Sideboom exclusive advantages against competitive rigs. See how these far-ahead features make you extra money all the way, from increasing rig availability to prolonging cable life!

See how you get more for your money and earn more with what you get in International Superior Sidebooms. And compare mobility, flotation, and ease of control to any other make. Let your International Superior Distributor give you an "on-the-line" demonstration.

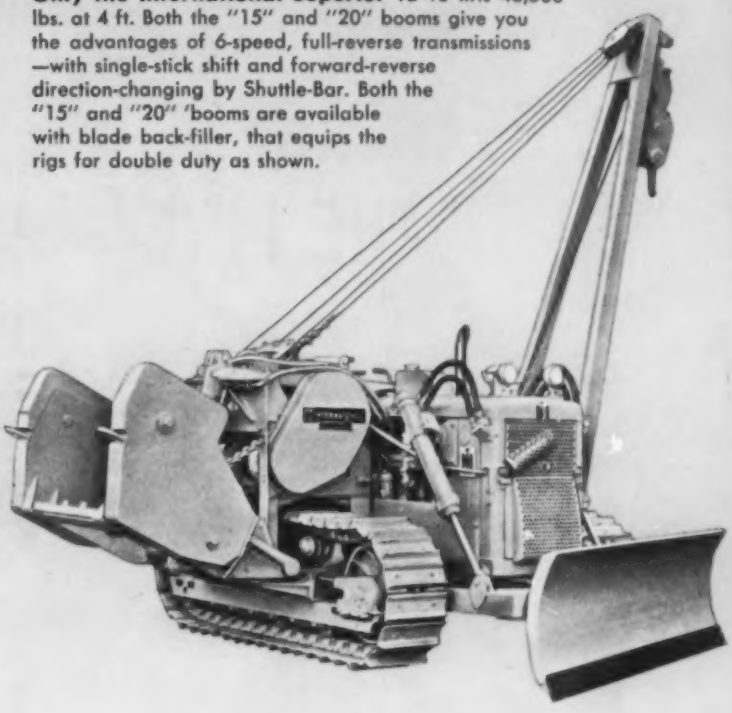


Individually-mounted drum shafts. On TD-25, TD-20, and TD-15 'booms, the load and boom cable drum shafts are individually mounted on separate, short-length large-diameter, alloy steel shafts. Sectional view of TD-20 design shows how these quiet-running gear-driven drums revolve on large, self-aligning anti-friction bearings—for long, trouble-free life. This design simplifies replacement of worn parts. Pipeliners the country over have proved that direct center-to-center cable pull from boom and load sheaves to drum assure substantially greater sheave and cable life.

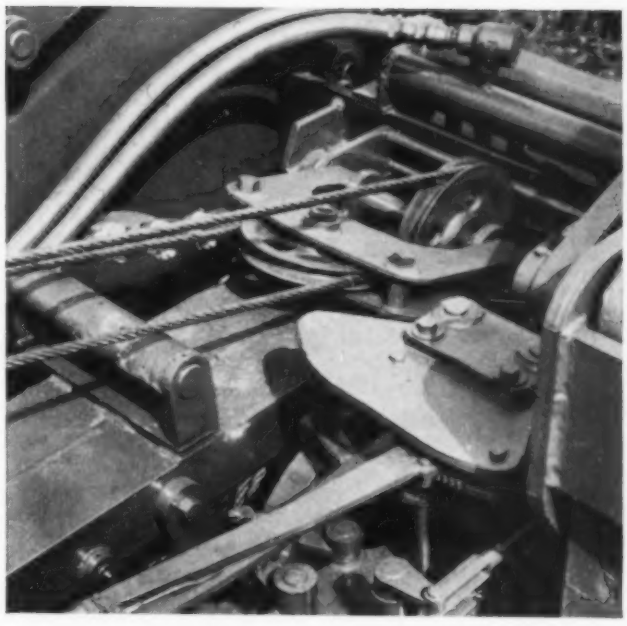
Choose the TD-20 Sideboom with 7-roller track frame—and you get flotation unavailable elsewhere in the 75,000 lb. lift class. The "20" is smoothly powered by a 6-cylinder, 134-hp International Diesel engine.



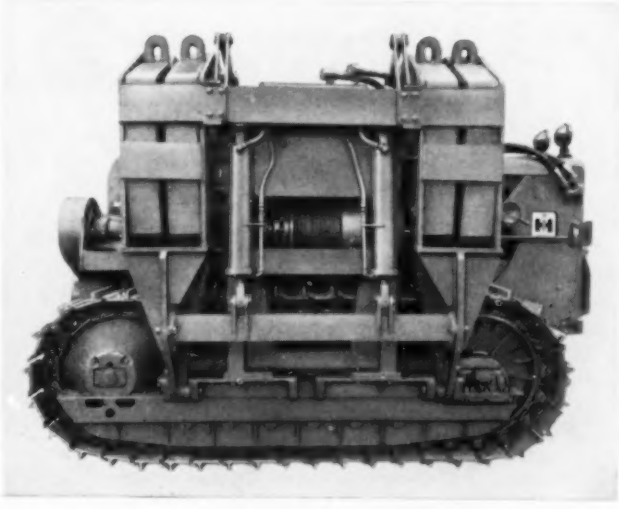
Only the International Superior TD-15 lifts 46,500 lbs. at 4 ft. Both the "15" and "20" booms give you the advantages of 6-speed, full-reverse transmissions —with single-stick shift and forward-reverse direction-changing by Shuttle-Bar. Both the "15" and "20" booms are available with blade back-filler, that equips the rigs for double duty as shown.



Fleeting Sheave Cable Life Protection. Only International superior Sidebooms give you the cable life-extending design of fleeting sheaves. You get fleeting sheaves on load and boom lines to distribute cable evenly on the drums and thus prevent "cable-killing" crushing and piling. Results: longer cable and sheave life, lower operating cost, less service.



Spread-speeding counterweight switching. International Superior Sideboom quick-change counterweights are the industry's easiest to change. Convenient lift eyes in the cast blocks assure that counterweighting can be quickly changed to match changing lift and terrain conditions—for spread-speeding operating efficiency and safety.



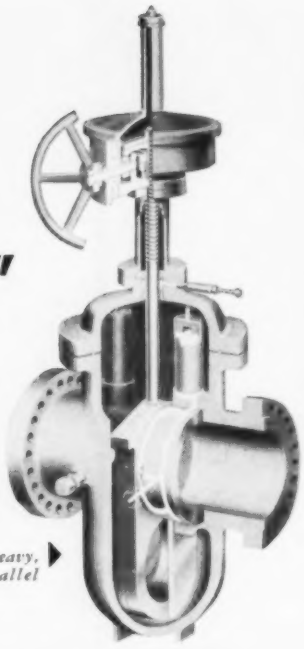
International Harvester Company, Chicago 1, Illinois

INTERNATIONAL®

SUPERIOR®

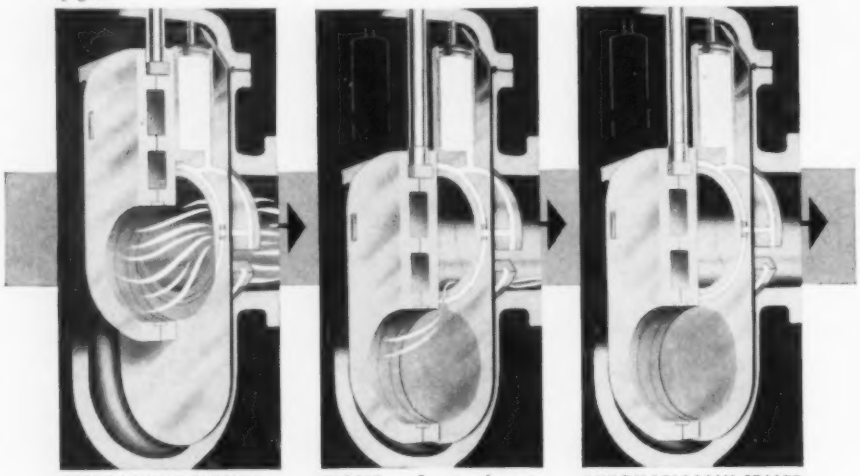
For more data on advertised products, use Readers' Service Cards, last page.

NEW ADVANTAGES "GO ON THE LINE" with DARLING-McEVOY Conduit Valves



RIGHT: *Cutaway showing heavy, self-aligning gate and parallel seat assembly.*

BELOW: *diagrams of closure action on downstream side of gate.*



APPROACHING CLOSURE... *No loss of sealant.*

CLOSED... *Jumper in gate permits differential pressure to feed sealant into seat groove.*

AUTOMATICALLY SEALED *...Pressures again in balance. Tightness established.*

Compare these features with *any* other pipe line gate valve:

1. EVERY CLOSURE LEAK-PROOF
2. NON-DIRECTIONAL FLOW
3. TWIN SEALANT RESERVOIRS
4. NEGLIGIBLE SERVICING
5. SMOOTH, FULL FLOW
6. REPACKING UNDER PRESSURE
7. EXCEPTIONAL PERFORMANCE AND LIFE

Darling-McEvoy conduit valves, made in 8" and larger sizes, are fully field proved. Now operating continuously on various major lines. For complete information on the self-sealing feature and many other advantages of this unique valve, ask for Bulletin 5402.

DARLING VALVES

DARLING VALVE & MANUFACTURING CO.

Williamsport 27, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

Arc Welder

A complete line of new three phase rectifier DC arc welders for general use in maintenance, production and structural welding has been announced by Lincoln Electric Company. The Idealarc R3M series, designed to NEMA industrial standards of 40 volts, 60 percent duty cycle, incorporates highly efficient silicon rectifiers to produce DC output in four sizes; 300, 400, 500 and 650.

Output characteristics have been engineered to prevent electrode sticking on low current, small diameter electrode applications. At high ampere settings the unit maintains a smooth, quiet arc transfer. The front panel contains the current control for continuous adjustment of full range output without making immediate range changes. Electrode and ground cable mounting studs have been recessed into the front panel and equipped with strain lugs to prevent damage from impact or cable tugging. Standard equipment includes a polarity switch for reversing current flow without changing cable connections.

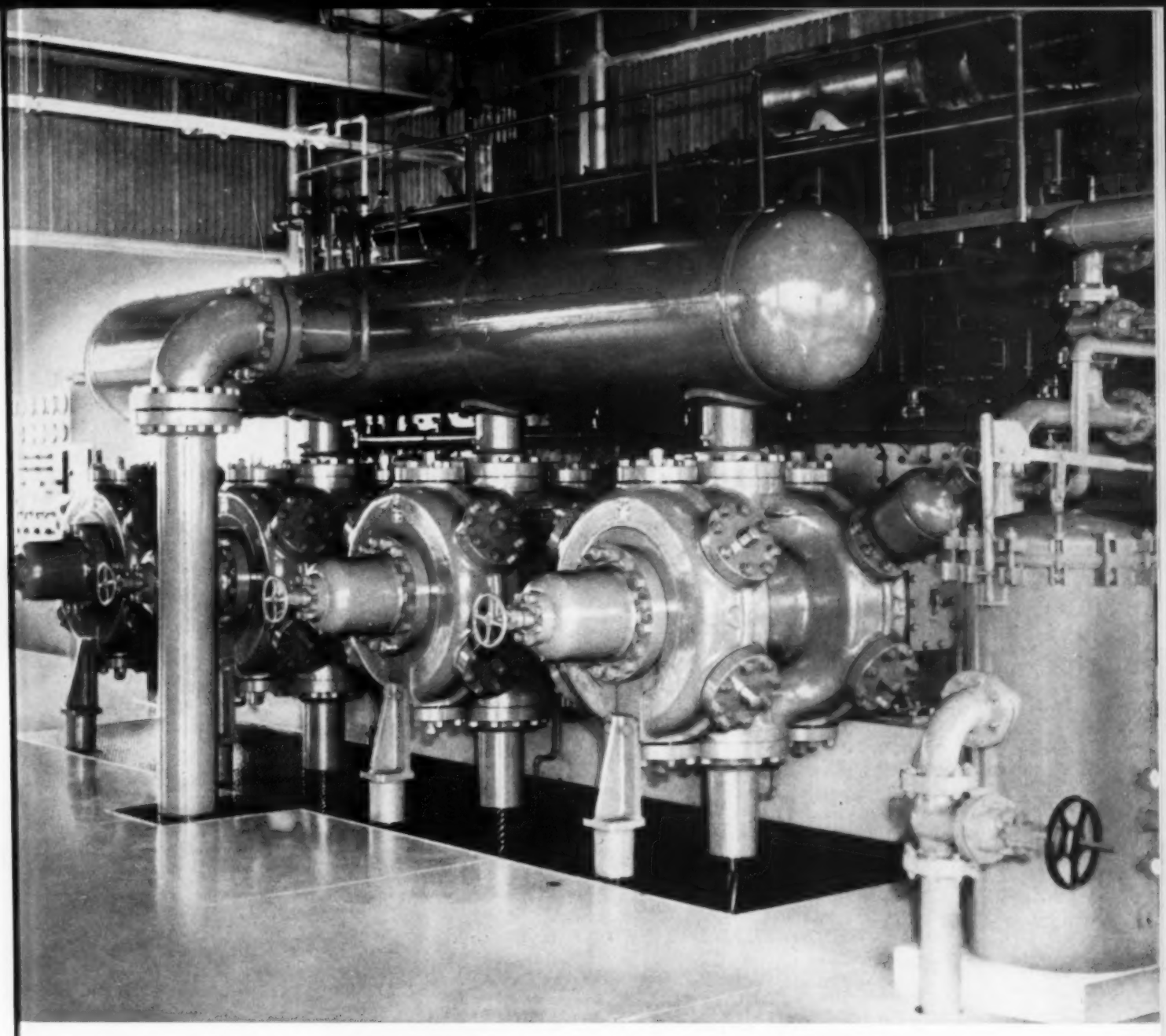
For more data, circle **No. E6** on Readers' Service Card, last page this issue.

Temperature Control

A dual switch indicating temperature control is one of the latest controls to be added to the United Electric-Controls Co. line of industrial temperature and pressure controls.

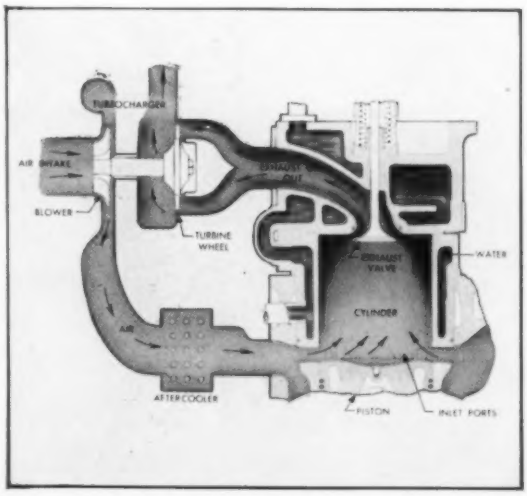
The E32NA is a wide range control (—150 to +650° F) featuring a calibrating mechanism which makes possible easy replacement of the thermal assembly in the field with no loss of calibration accuracy. The control contains two separate switches permitting switch action above or below the index set point and control of up to four independent circuits. The index scale is calibrated in the same easily-read values as the indicating scale to eliminate visual errors.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.



At Northern Natural's Clifton Station, this SUTC engine compressor operates

20 HOURS A DAY...FOR 3 STRAIGHT YEARS



Self-sustained turbocharging at any speed and load is possible because of SUTC's exclusive Uniflo scavenging.

Five years ago a remarkable new engine compressor was introduced.

Called the SUTC, this Worthington turbocharged 2-cycle engine compressor was unlike any other. Combustion air enters thru side inlet ports, *but the exhaust is thru overhead valves.* Valve timing can be arranged to give maximum supercharging effect.

On paper, straight-thru or "Uniflo" scavenging has many advantages. The turbocharger operates over the entire speed and load range without help from external sources. Scavenging efficiency is increased and pulsations practically eliminated.

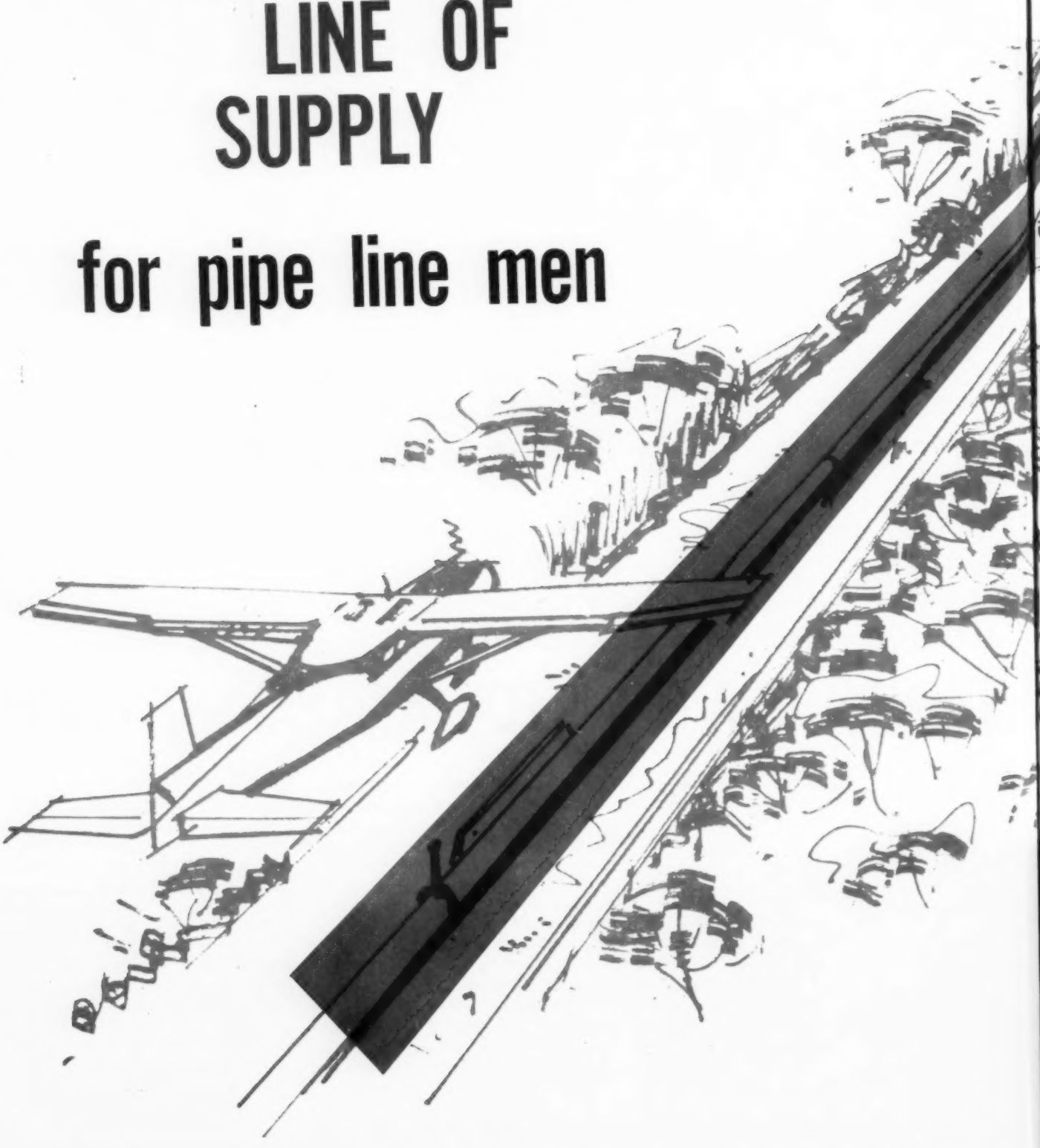
Now came the real test. More than 130,000 hp were installed. Operators praised the SUTC's exceptionally smooth, quiet operation. Operational records confirm the machines reliability. Unit G-2312 is typical. This 8 cylinder, 2000 hp SUTC engine compressor was installed in 1957 in Northern Natural Gas Company's Clifton, Kansas Station. To date, it has logged over 20,000 hours—an average of more than 20 hours a day for 3 straight years. A sister unit installed last year has equalled this performance.

May we send you complete data on this unique engine compressor? Please write to H. C. Barten, Worthington Corporation, P.O. Box 953, Buffalo 5, N.Y.

WORTHINGTON

THE STRAIGHTEST LINE OF SUPPLY

for pipe line men



If you buy for the pipe line industry, you don't need to maintain an elaborate, bulky file of suppliers' literature. Simply keep at hand your copy of PIPE LINE CATALOG . . . the shortest, most efficient pipe line between you and pipe line equipment, materials and services.

Hundreds of manufacturers, suppliers and service companies file complete or condensed catalogs in PIPE LINE CATALOG . . . many publish no other catalog. If you use the catalog for your buying, you take advantage of a convenient, up-to-date, one-volume, reference. You have constantly available complete information and comparative data on thousands of products and services.

The next time you buy or specify, save time and effort – and money – by going through PIPE LINE CATALOG . . . your *straightest line of supply!*

PIPE LINE CATALOG

Published by PIPE LINE INDUSTRY

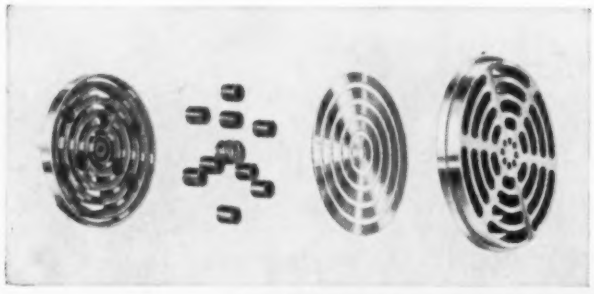
GULF PUBLISHING COMPANY • BOX 2608 • HOUSTON 1, TEXAS • JA 9-4301

World's Largest Specialized Publisher to the Oil Industries

OFFICES: Chicago, Dallas, Tulsa, Cleveland, Los Angeles, Summitt, N. J., London, England; Köln-Braunsfeld, Germany

VOSS VALVES will mean LESS MAINTENANCE FEWER SHUTDOWNS for your COMPRESSORS

Voss Valves are made to specification, machined from solid stock (not cast)—using best alloy steels; for corrosion condition—stainless steels, such as 410, 18-8 or non-ferrous alloys—monel, inconel, etc. Plates are machined (not stamped) and ground for precise close tolerance fit; are dimensionally stable . . . ductile . . . resist fracture, high temperatures and corrosion . . . withstand fatigue. Springs of heavy rectangular sections and large diameters add to dependability and safety.

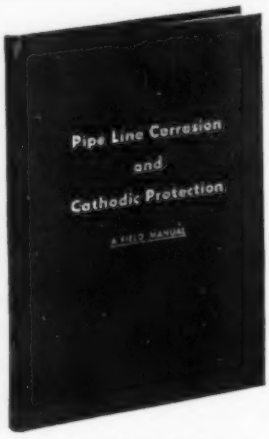


- up to 40% more valve area
- minimum pressure loss
- higher efficiency
- less power consumption
- normal discharge temperature
- quiet, vibration-free
- utmost safety
- lower operating costs

For detailed proposal send name, bore, stroke and speed of machine.

J. H. H. VOSS VALVES REG. U.S. PAT. OFF.

J. H. H. VOSS Co., Inc.
785 East 144th Street,
New York 54, N. Y.



The most practical on-the-job manual for men concerned with pipe line corrosion.

Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This book is designed as a practical field manual. It provides workable methods that can save you valuable time and effort in obtaining interpretive field data.

Contents (Condensed). Soil Resistivity Surveys, Pipe-to-Soil Potentials, Line Currents, Current Requirement Surveys, Rectifier System for Coated Lines, Ground Bed Design and Installation, Magnesium Anodes on Coated Lines, Hot Spot Detection, Stray Current Electrolysis, Interference in Cathodic Protection, Operation and Maintenance, Coating Inspection and Testing.

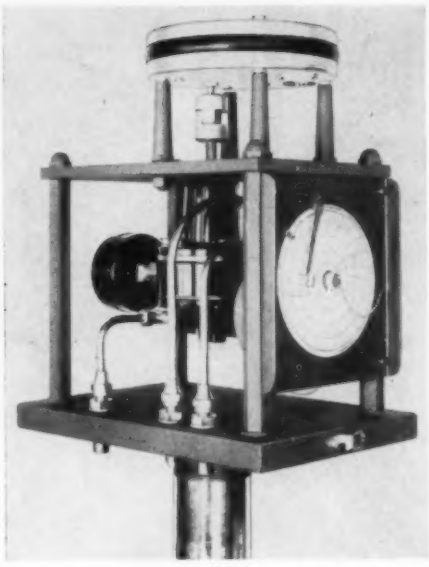
Appendices cover: Fundamentals of Underground Corrosion, Basic Principles of Cathodic Protection. Plus . . . tables and properties of metals, attenuation equations and index.

108 pages, illustrated. . . . Price $3.00

Send for your FREE copy of the New Petroleum Book Catalog which describes the nature and contents of many books pertaining to the Petroleum Industry.

ADDRESS:

Book Department
GULF PUBLISHING COMPANY
P. O. BOX 2608
HOUSTON 1, TEXAS



Gas Sampler-Analyser

A continuous gas sampler for the accurate determination of chemical and physical properties of gas has been developed by ARCCO Instrument Company, Inc. The Model M-R Continuous Gas Sampler will, over a period of seven days, accumulate at constant rate a sample of gas to a final pressure at or near 140 psig from the sample source—the minimum pressure of which is not less than 160 psig.

The Model is supplied with a mechanical drive and includes a pressure recorder in a single case and is available for sample ranges up to 150 psig when required. However, the instrument can be furnished for lower pressure samples. The design is based on the principle that the maintenance of a constant rate of increase in gas pressure within a closed container will result in a constant rate of flow of gas into the closed container. This constant rate of increase is accomplished by means of a regulation system equipped with a precision driving mechanism.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.

Fuel Oil Gage

A maintenance minder fuel oil pressure gage, designed to solve problems of trouble-shooting a balky fuel supply system, has been developed by Hicklin GM Diesel, Inc.

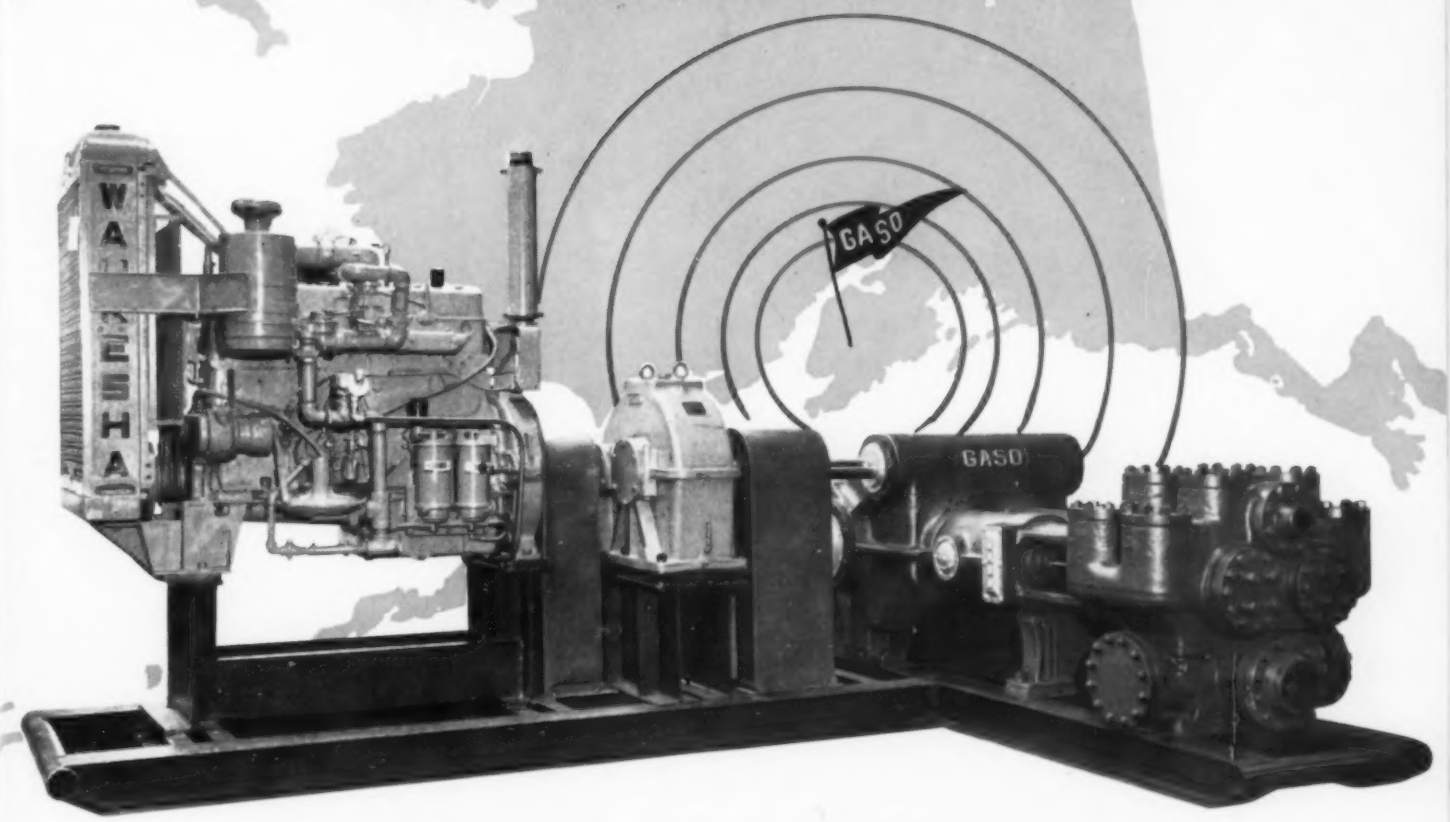
This is a pressure gage calibrated from zero to 100 psi for positive readings at any pressure range. The gage face is divided to show safe and unsafe zones of pressure. Any point on the fuel line can be checked and compared between the pump and the secondary fuel filter to track down pressure variations. Engine oil pressure can be taken at points on the oil lines and comparative results noted to determine unusual pressure variations. The complete gage assembly comes in its own steel carrying case to protect it when not in use.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

Oil Separator

De Laval Separator Company, Poughkeepsie, N.Y., announces a special design, high-capacity separator originally developed by the U. S. Navy for jet fuel purification. The purifier is capable of separating

DESTINATION:
KENAI PENINSULA, ALASKA



GASO PUMPS BRING GASO PERFORMANCE TO THE 49TH STATE

The photograph shows one of two Gaso Pumping Units delivered to the Kenai Pipe Line Company. The assembly consists of a Gaso Figure 2651, 5½"x12" Horizontal Duplex Piston Power Pump direct connected through a Lufkin 4.25 to 1 gear reducer to a Model 6-WAKBU Waukesha Oilfield Power Unit.

Normal operation calls for 435 barrels of crude oil per hour—10,440 barrels per day—at 500 pounds discharge. Under emergency conditions the pump will deliver the fluid at 950 pounds discharge.

The world-wide preference for Gaso Pumps stems from performance that speaks a language all pipe line engineers understand—a language of completely dependable service for longer periods of time, with less maintenance, all adding up to greater returns on the pumping investment.

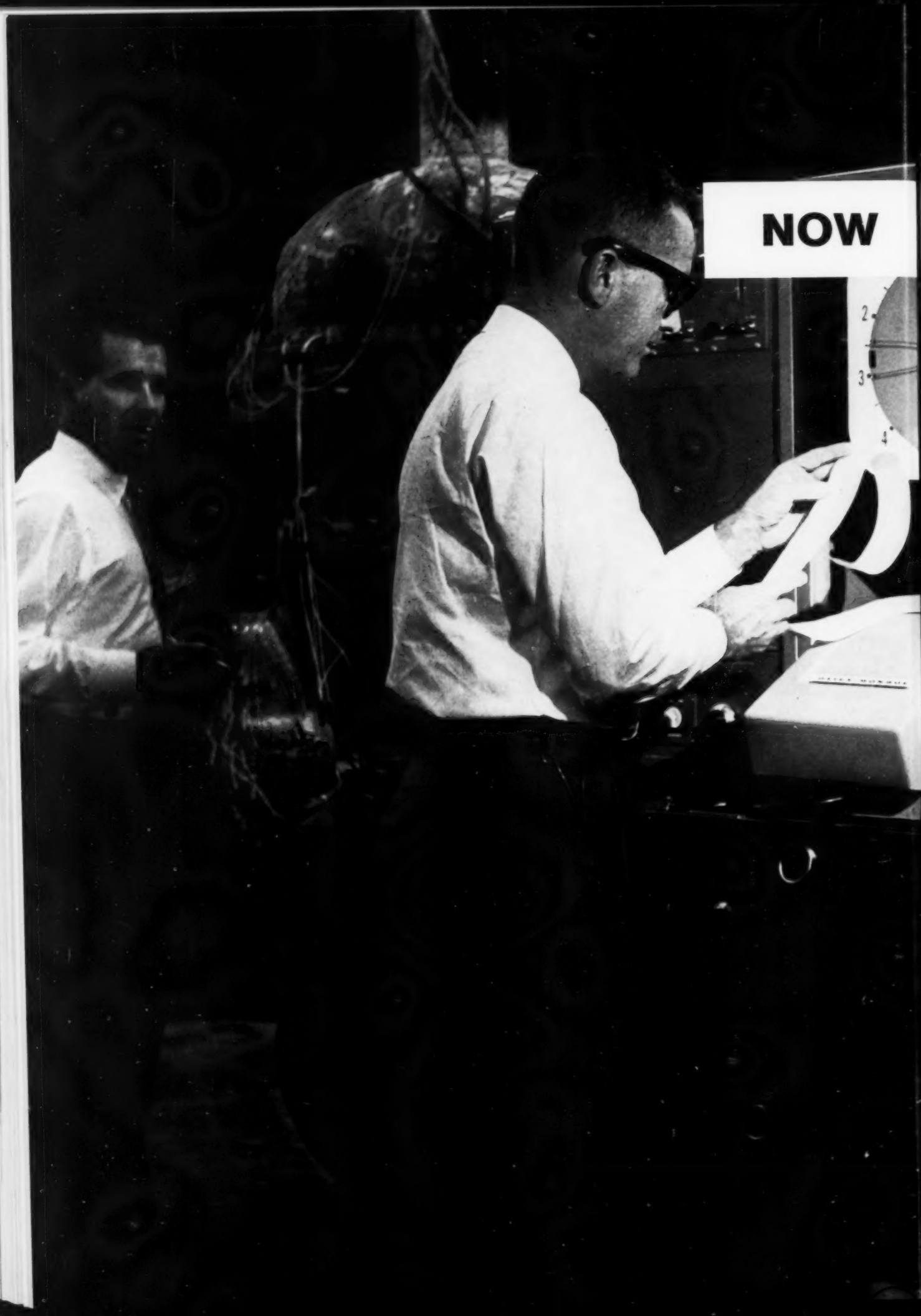
SEND FOR OUR 1960-61 CATALOG

GASO PUMPS
for every oil industry need

DISTRIBUTORS

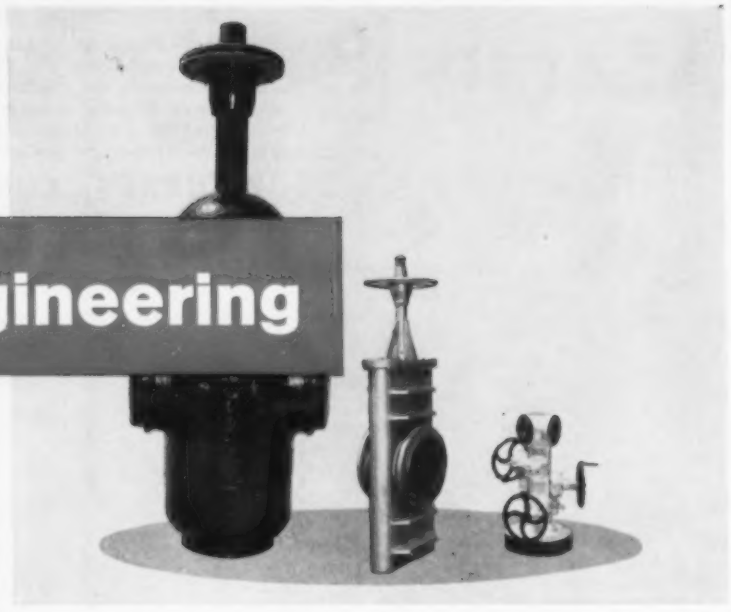
Farmington, N. M.—Gaso Pump & Burner Mfg. Co. • Shreveport, La., Odessa, Texas, Brookhaven and Tinsley, Miss.—W. L. Somner Company • Houston, Texas—Texas Pump & Compressor Company • Wichita Falls, Texas—Pump Engineering Co. • Evansville, Ind.—Hague Equipment Co., Inc. • Long Beach and Bakersfield, Cal.—Power Pumps, Inc. • Casper, Wyoming—Lufkin Foundry & Machine Co. • Edmonton, Alberta—Lufkin Machine Co., Ltd.

GASO PUMP & BURNER MFG. CO. First and Lansing Streets, Tulsa Oklahoma • Export Office: Empire State Building, New York, N. Y.


NOW

TOTAL Valve Engineering

NEW W-K-M COMPUTER PREDICTS PERFORMANCE



Left to right above, W-K-M's new: *Safe-T-Seal* Gate Valve (ASA); Pressure Sealing Gate Valve (ASA); Cross-type Triple Gate Valve (API).

Unique strain gauge analyzer pre-solves your valve problems

In *seconds* it gives answers that used to take *days*. This unusual digital logging computer developed to W-K-M engineering specifications finds out what will happen to a valve under every conceivable service stress.

The W-K-M computer measures strain, applies corrections for temperature, test material and gauge factors, and prints the results of its stress calculations. It can analyze 40 areas of a valve in less than 40 seconds!

Advanced research is an important part of TOTAL Valve Engineering—W-K-M's unique dedication to *all* phases of valve technology. Another reason why W-K-M Valves perform better, last longer . . . on the world's toughest jobs.

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

6008-R

NEW

- automatically normalizes current in DC teleprinter signal loops
- eliminates metering and manual adjustments
- effects savings in maintenance costs
- may be used on polar or neutral DC circuits
- requires no supplemental power supply

TRANSISTORIZED LOOP CURRENT CONTROL

Type 238: Model 1, for 60 ma DC loops; Model 2, for 20 ma DC loops

Pace-Setters in Quality Communication Equipment

NORTHERN RADIO COMPANY, inc.

147 WEST 22nd ST., NEW YORK 11, NEW YORK

In Canada: Northern Radio Mfg. Co., Ltd., 1950 Bank St., Billings Bridge, Ottawa, Ontario.

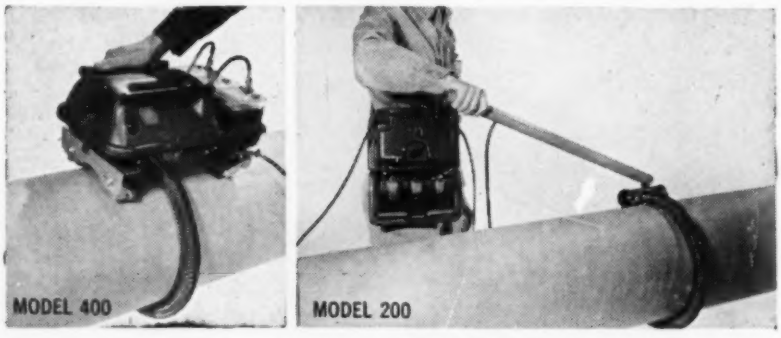
WRITE ON YOUR LETTERHEAD TO DEPT. PI.

Spy Detector

QUALITY SERVICE

is there . . . when you need it!

. . . our SPY HOLIDAY DETECTORS are as near as your telephone— in fact, in emergencies our own plane assures immediate service



Rugged equipment for dependable holiday detection on ¾" to 36" pipe . . . signal—bell, light and spark . . . unaffected by dew or frost.

Call, wire or write.

Pipeline Inspection Co., Inc.

2104 WYANDOTTE STREET • KANSAS CITY, MISSOURI

Day Phone: BAltimore 1-6036

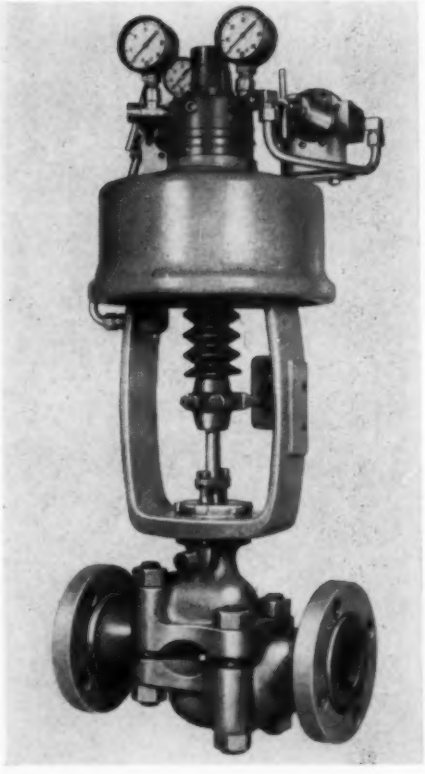
Night Phone: HI 4-6745, EM 1-3824

sea water, solids and other sources of contamination from jet fuel and other products at a rate of 12,000 gallons per hour.

Fuel entering the purifier bowl spinning at 4,100 rpm is separated from water and solids by centrifugal action. The fuel leaves the purifier by one effluent direct into the fuel tanks. At the same time water is discharged carrying some solids with it. Remaining solids are retained within the bowl in a solid holding space which has a capacity of over 60 pounds.

Forging for the unit was done by Wyman-Gordon Company at the closed-die forging press at the Wyman-Gordon-U.S. Air Force plant at North Grafton, Mass. A design problem overcome was the deft balance required which would permit the bowl and its centrifugal pump to process the required 12,000 gallons per hour on a continuing basis with no possibility of error.

For more data, circle **No. E10** on Readers' Service Card, last page this issue.



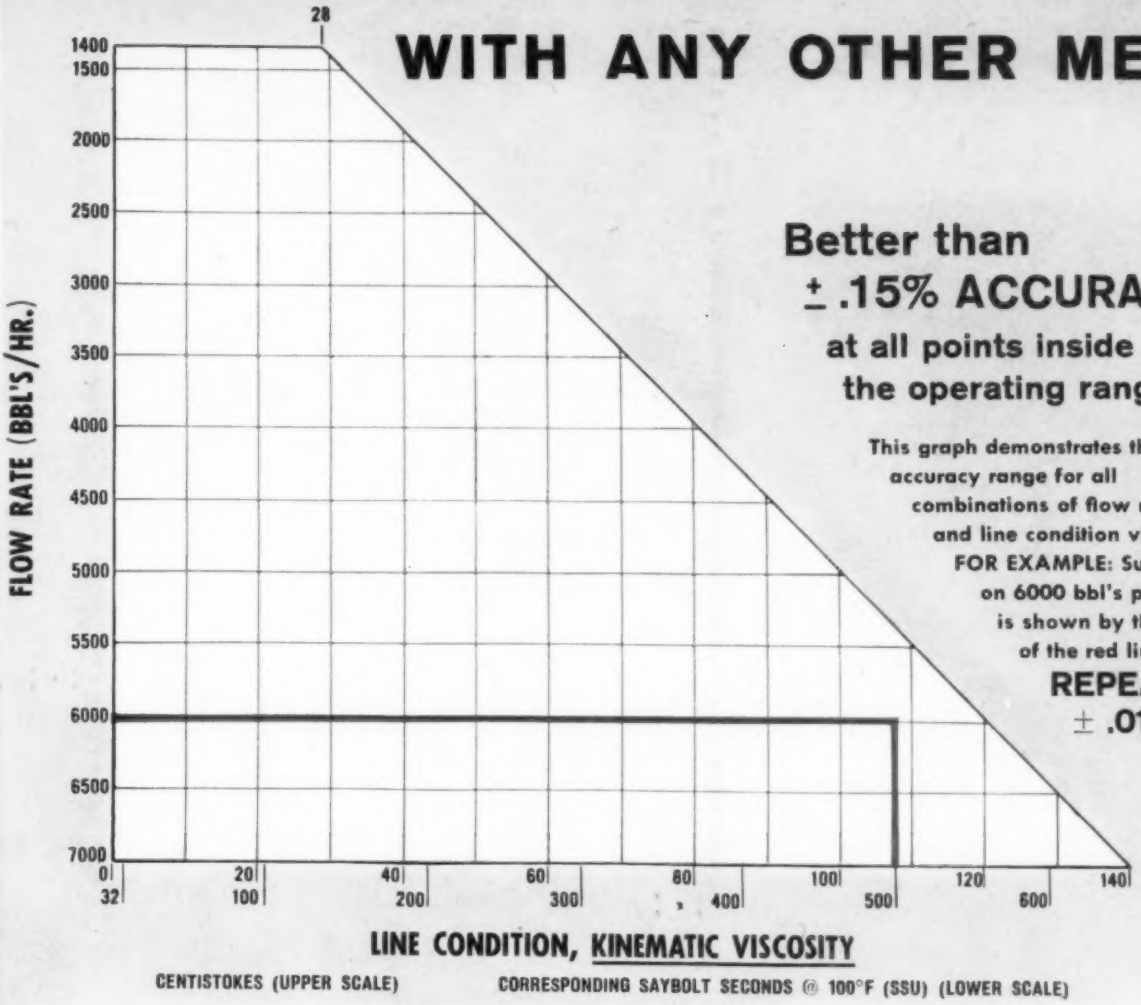
Split-Body Valves

A series of split-body valves interchangeable on a "mix and match" basis with other valves and actuators it now produces has been introduced by Minneapolis-Honeywell Regulator Company. The split-body valve, available in straight-through, angle and corner types with fixed or separable flange contruction, is designed for free passage of even highly viscous fluids.

Clamped-in seat ring, metal or Teflon guiding, non-lubricated V-ring packing and contoured equal-percentage, linear or quick-opening plugs are other features of the split-body valve.

For more data, circle **No. E11** on Readers' Service Card, last page this issue.

TRY AND MATCH THIS PERFORMANCE WITH ANY OTHER METER



Better than
± .15% ACCURACY
at all points inside the operating range shown

This graph demonstrates the ±.15% accuracy range for all combinations of flow rates and line condition viscosities.
FOR EXAMPLE: Successful operation on 6000 bbl's per hour at 500 SSU is shown by the intersection of the red lines.

REPEATABILITY
± .015%

NEW, MODEL 7M ROCKWELL
10" TURBO-METER

The model 7M Turbo-Meter body is the same diameter as 10" pipe. The case is steel. Flanged connections of 150, 300, or 400 ASA are available.

The 10" size supplements the 16" Model 15M(15000 BPH) Turbo-Meter.

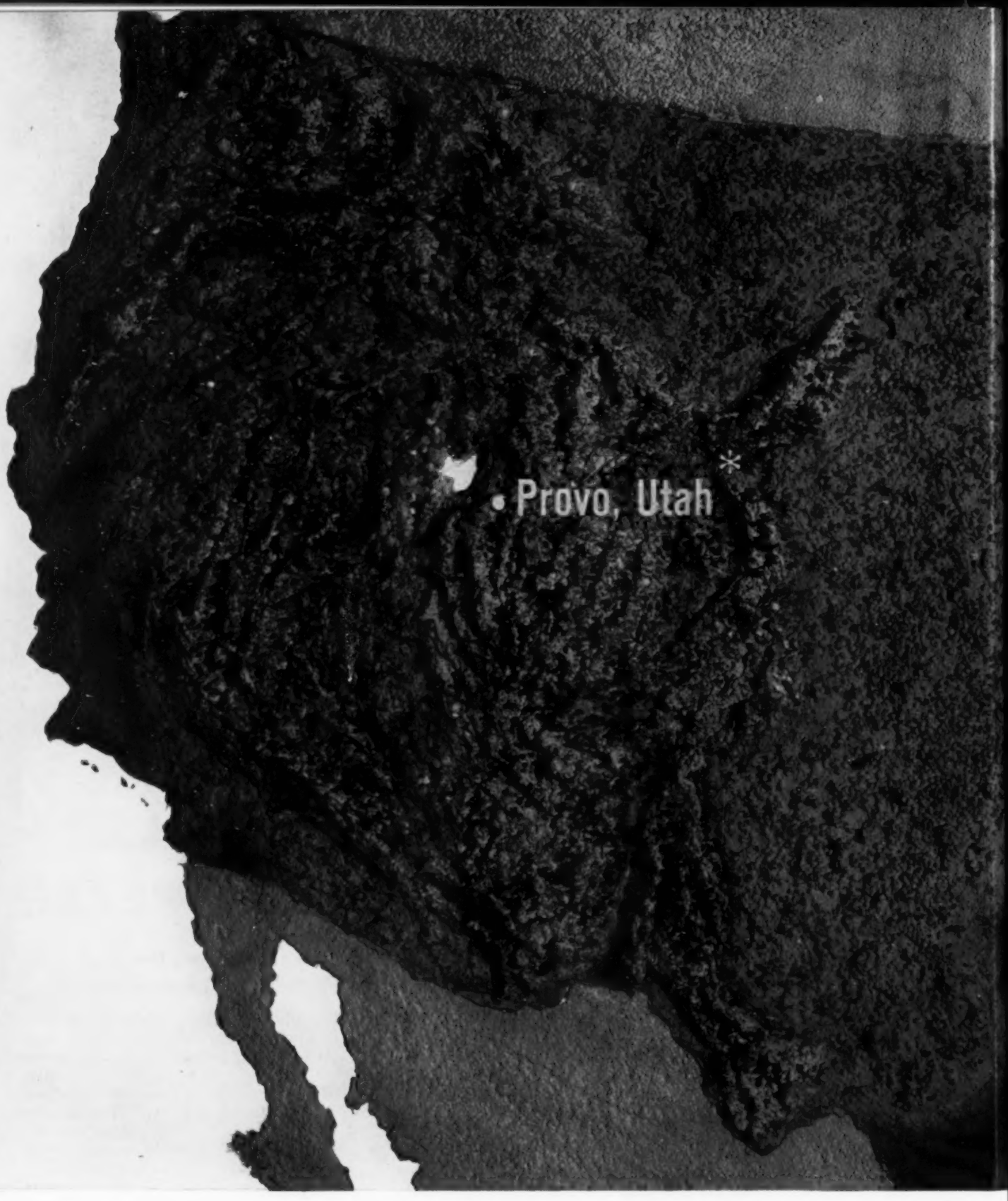
The Model 7M Rockwell Turbo-Meter in 10-inch size provides you with a new standard for accuracy and convenience when measuring large volumes of either finished or crude petroleum products.

With this design, when viscosities change, no manual attention is ever required since a built-in viscosity compensator automatically makes the necessary corrections. The same meter will handle liquid viscosities ranging from heavy crudes to gasoline and maintain accuracy within ±.015% without adjustment.

A smooth running air foil turbine rotor, ball bearing mounted, provides accurate, long lived measurement. Head loss is negligible and meter maintenance is minimized. A magnetic drive to the register eliminates the need for a stuffing box. Electrical registration or telemetering is optional.

Write for bulletin PI 417 Rev. 1 to Rockwell Manufacturing Company, Dept. 125M, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ont.

TURBO-METERS
another fine product by
ROCKWELL



Only USS National Line Pipe is made in so many places... and so well

Watch United States Steel's special Christmas show, **The Coming of Christ,** in Color on NBC-TV, Wednesday, December 21, 8:30 P.M., E.S.T.

Convenient to you—a complete range of grades and sizes of QUALITY line pipe, no matter where you are. These five pipe mill locations will give you excellent service.

*Consolidated Western Steel Division of United States Steel.

USS and National are registered trademarks

National Tube Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York

This mark tells you a product is made of modern, dependable Steel

RENT
Everything for pipeline construction from
MYOCO

PIPE WRAPPING MACHINES
COATING & WRAPPING
CLEANING & PRIMING
ASPHALT KETTLES
PIPE CRADLES
BEVELING MACHINES
INTERNAL LINE-UP CLAMPS
EXTERNAL LINE-UP CLAMPS
HOLIDAY DETECTORS
PIPELINE LOCATORS

Why tie-up your capital in purchasing equipment, when you can rent all these items, and numerous others, for pipeline construction. And you get around-the-clock service from our experienced personnel . . . dependable operation of equipment assured by periodical checks. No delay, parts and supplies shipped same day ordered when possible.

WRITE FOR CATALOG

MORRIS-YOUNG-OWENS CO.
PIPELINE EQUIPMENT AND SUPPLIES
P. O. Box 35137 • Houston 35, Texas
PArkview 3-0110
In Canada: MYOCO LIMITED, Rural Route 1, Midland Ave. N., Agincourt, Ontario, Canada
Tel. WA 2-9444

New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers' Index. Simply circle code numbers of items desired—sign and mail card.

Radiography Cameras

A catalog sheet describing the Radionics Incorporated line of Cobalt 60 panoramic radiographic cameras has been released. The bulletin includes details on the use of cobalt in radiographing, construction of the units, operation and specifications.

Radionics offers five basic models in its 60 series. Models 60-1, 60-5, 60-10, 60-30 and 60-100.

To get a copy, circle **No. E12** on Readers' Service Card, last page this issue.

Valve Actuator

A sixteen-page engineering data book on valve motorization is available from SADI. The booklet is titled "Type RX Servo-Motor for Remote Control of Valves" and presents a complete presentation of basic technical information on valve actuator applications with special emphasis on remote installations and operation of number of valves in-series.

To get a copy, circle **No. E13** on Readers' Service Card, last page this issue.

Boring Units

A bulletin has been published by Kwik-Mix Company on its E300 electric powered boring unit. The machine has a wide range from 40 feet of 48-inch in diameter hole to 240 feet of 12-inch diameter hole, vertical, horizontal, or angular boring.

The unit consists of a 440-volt, 3-phase, 60-cycle squirrel cage motor; two different gear ratios; a protective slip clutch; maintenance swing thrust bearing on reduction gear; power or gravity auger feed; and control panel with remote single lever control.

To get a copy, circle **No. E14** on Readers' Service Card, last page this issue.

American Chain Company

American Chain & Cable Company, Inc. has published a booklet on explaining the operation of the company and products which it makes.

The firm has 15 separate divisions and 8 subsidiaries which manufacture hundreds of different products in 25 plants located in 22 cities in the United States, Canada and England. Some of the products are chain; tire chains; wire rope; push-pull controls; cable assemblies; steering controls for boats; welding wire; electric and chain hoists; overhead traveling cranes; valves; pressure gages and digital data logging equipment.

To get a copy, circle **No. E15** on Readers' Service Card, last page this issue.

JM Compressors

Cooper-Bessemer has published a 4-page brochure describing the operating characteristics of the company's 4,000 horsepower JM compressors. This is the first literature published on this unit, a development of the M-line series featuring Cooper-Bessemer natural force balance. The unit contains advanced cylinder designs for maximum working pressures from vacuum to 15,000 psi.

The booklet also describes En-Tronic controls which can make the JM unit into a completely automatic system which starts itself, shuts down itself, or operates fully unloaded.

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.

Control Equipment

International Controls Corporation has published a booklet describing new type off-the-shelf equipment for application to remote control and data monitoring problems in the pipe line and production industries. The unit is a general purpose item, capable of solving approximately 80 percent of pipe line and production control problems.

The basic unit can measure and transmit eight variables and 16 on-off functions. Transistorized circuitry is incorporated in the unit. The booklet includes illustrations, diagrams and specifications.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Automatic Flow Control

A four page folder describing and illustrating an automatic pre-determined counter that provides push button control of fluid measuring, batching, mixing or blending, has been issued by Potter Aeronautical Corporation.

The Model 524 Preset Totalizer, is of compact, modular plug-in construction, transistorized and print-wired. The folder describes a small plant installation, eliminating the weighing tank on scale, batch tanks, and associated plumbing.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

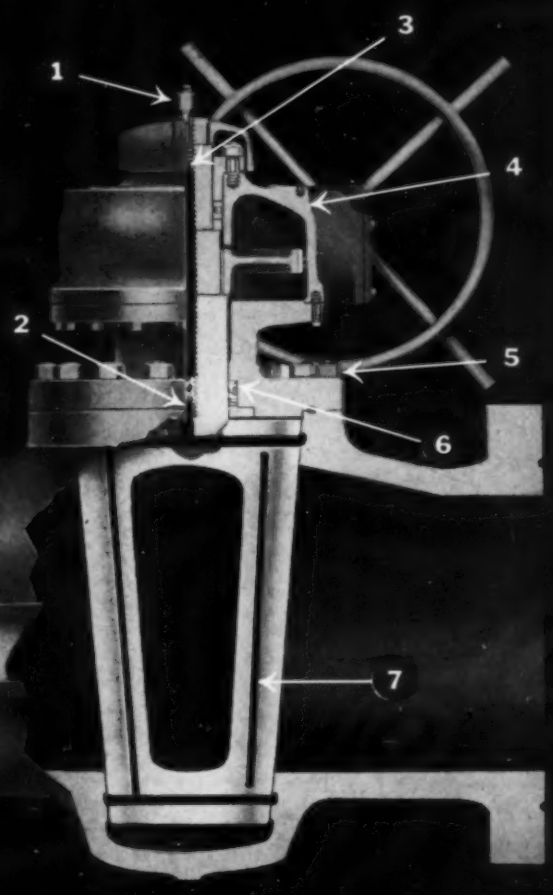
Belt Slings

A six-page brochure on a complete line of safety weave synthetic web belt slings has been issued by Wire Rope Division of Jones & Laughlin Steel Corporation.

The brochure contains information about nylon and dacron slings, including data showing resistance to all common agents; charts listing dimensions and capacities of synthetic slings in vertical choker and basket applications and available aluminum and steel fittings for nylon and dacron slings.

To get a copy, circle **No. E19** on Readers' Service Card, last page this issue.

7 characteristics that make WALWORTH a better Lubricated Plug Valve



1. Valve can be lubricated with a Walworth High Pressure Lubricant Gun without removing lubricant fitting.

2. Double ball check valve prevents line pressure from getting into lubricant system.

3. Groove, cut part way up side of lubricating fitting, provides extra safety feature by allowing operator to note any tendency of lubricant to blow out **before** fitting is entirely removed.

4. For buried pipelines—gear housing design permits simple attachment of lubrication and handwheel extensions without modifying the gearcase.

5. Standard bolt threads, rather than fine threads, means easy replacement of nuts and bolts from local stocks.

6. Two overlapping Teflon* packing rings form an effective seal against possible leakage without "grabbing" the plug shank. Low break-out torque—plug turns easier.

7. Vertical and circumferential lubricant grooves completely frame the port openings, assuring a tight seal against leaks.

*Du Pont registered trade-mark

Cutaway of a 24-inch Walworth Lubricated Plug Valve

you always know that a WALWORTH LUBRICATED PLUG VALVE will operate

No matter when you need it, you can count on a Walworth LPV to operate easily and dependably in handling gas, crude or finished products. In petroleum service throughout the world, these valves have long proved their complete dependability and easy maintenance. Walworth also designs and manufactures Gate, Globe, Angle and Check Valves for the oil and gas industries. For information, write Walworth Company, Lubricated Plug Valve Division, 3517 Polk Avenue, Houston 23, Texas.

WALWORTH

750 THIRD AVENUE, NEW YORK 17, N. Y.
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO. M&H VALVE & FITTINGS CO. • SOUTHWEST FABRICATING & WELDING CO., INC. • WALWORTH COMPANY OF CANADA, LTD.

For more data on advertised products, use Readers' Service Cards, last page.

The Name that MEANS Highest Quality Performance

CONSTRUCTION
SHAMROCK
COMPANY

- CRUDE • PRODUCTS
- NATURAL GAS PIPELINES
- STATIONS • SKILLED PERSONNEL
- MODERN METHODS
- NEW EQUIPMENT
- EXPERIENCE

—More than 20 years

H. F. FINNERTY, *President*

P. O. Box 1177 • LANSING, MICHIGAN
1804 W. Saginaw • phone IVanhoe 4-9433

90% *cut in operating and maintenance cost means*

CASH in the BANK for you!

New, Transistorized

M-SCOPE PIPE FINDER

only

$189.50

Rugged, transistorized construction practically eliminates maintenance costs . . . extends battery life to a year or more. Pinpoint accuracy, greatest depth penetration make the M-Scope first choice in the field!

New, Heavy Duty LEAK DETECTOR. $295.00

Send for FREE 1960 Catalog.

FISHER
Research Laboratory, Inc.
Dept. PI-4, Palo Alto, California

Advertisers' Index

• Dot preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current (1960-61) third revision of The Pipe Line Catalog.

A

• ACF Industries, Inc.
W-K-M Division 90-91
• Aerotec Industries, Inc. 62
Aerovent Fan Co. 73b
Ansco Division
General Aniline & Film Corp. 7

B

• The Babcock & Wilcox Co.
Tubular Products Division 10
• Borg-Warner Mechanical Seals
Division Borg-Warner Corp. 78
Brown-Fogle Equipment Co. 101

C

Classified Advertising 78
Columbia-Geneva Steel Division
United States Steel 94-95
• Cook Paint & Varnish Co. 77
• G. A. Cotten Co. 98c
• Crose-Perrault Equipment Corp. 66
• Crutcher-Rolfs-Cummings, Inc. 72
W. H. Curtin & Co. 73a

D

• Darling Valve & Mfg. Co. 84
• S. D. Day Co. 79a
De Laval Steam Turbine Co. 20

E

• Thomas A. Edison
Instrument Division McGraw-Edison 5

F

Fisher Research Laboratory, Inc. 98b
Fleet-Line Co. 74b
Ford Motor Co. 8-9

G

• Gaso Pump & Burner Mfg. Co. 89
General Aniline & Film Corp. 7
General Electric Co. 18-19
Greenhead, Inc. 65
• Grove Valve & Regulator Co. 80
Gulf Oil Corp. 70-71
• Gulf Publishing Co. 88b

H

• Hydril Company 102

I

International Harvester Co. ..... 59 and 82-83

J

Jones & Laughlin Supply Division 14-15

K

Koppers Co. 53

L

• Lone Star Steel Co. 2

M

Magnetrol, Inc. 79c
• F. H. Maloney Co. 11
• Mason-Neilan Division
Worthington Corp. 16-17
• McGraw-Edison 5
Minneapolis-Honeywell 63
• Mixing Equipment Co. 61
• Morris-Young-Owens Co. ..... 56a, 68 and 96

N

National Tube Division
United States Steel 94-95
• Northern Radio Co. 92a

P

• Pipe Line Catalog 86-87
• Pipe Line Industry 57
Pipeline Cleaners Co. 60
• Pipeline Inspection Co. 92b
Pittsburgh Chemical Co.
Subsidiary Pittsburgh Coke & Chemical Co. 75

R

Radio Frequency Laboratories, Inc. 6
• Reilly Tar & Chemical Corp. 76
• Rockwell Manufacturing Co. ..... 12-13 and 93
• The Ruberoid Co. 64

S

Shamrock Construction Co. 98a
• M. B. Skinner Co. 56b
Solar Aircraft Co.
Subsidiary International Harvester Co. 59
Southern Pipe Coating, Inc. 54
Standard Pipeprotection, Inc. 58
• Steel Forgings, Inc. 54
• Superior Equipment Co. 82-83

T

The Trane Co. 55
• Tubular Products Division
The Babcock & Wilcox Co. 10

U

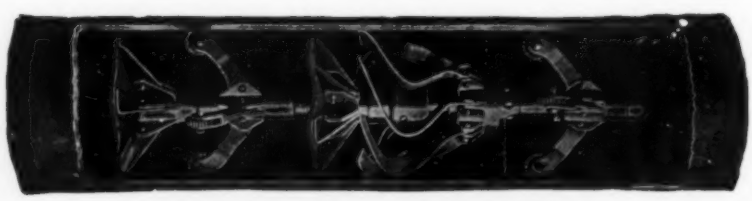
UGC Instruments 69
United States Steel Corp. 94-95
United States Steel Export Co. 94-95
• Universal Oil Products Co. 67

V

Vermeer Mfg. Co. 74a
• J. H. H. Voss Co. 88a

W

• W-K-M Division
ACF Industries, Inc. 90-91
• Walworth Co. 97
Williams Brothers 79b
• Worthington Corp. ..... 16-17 and 85

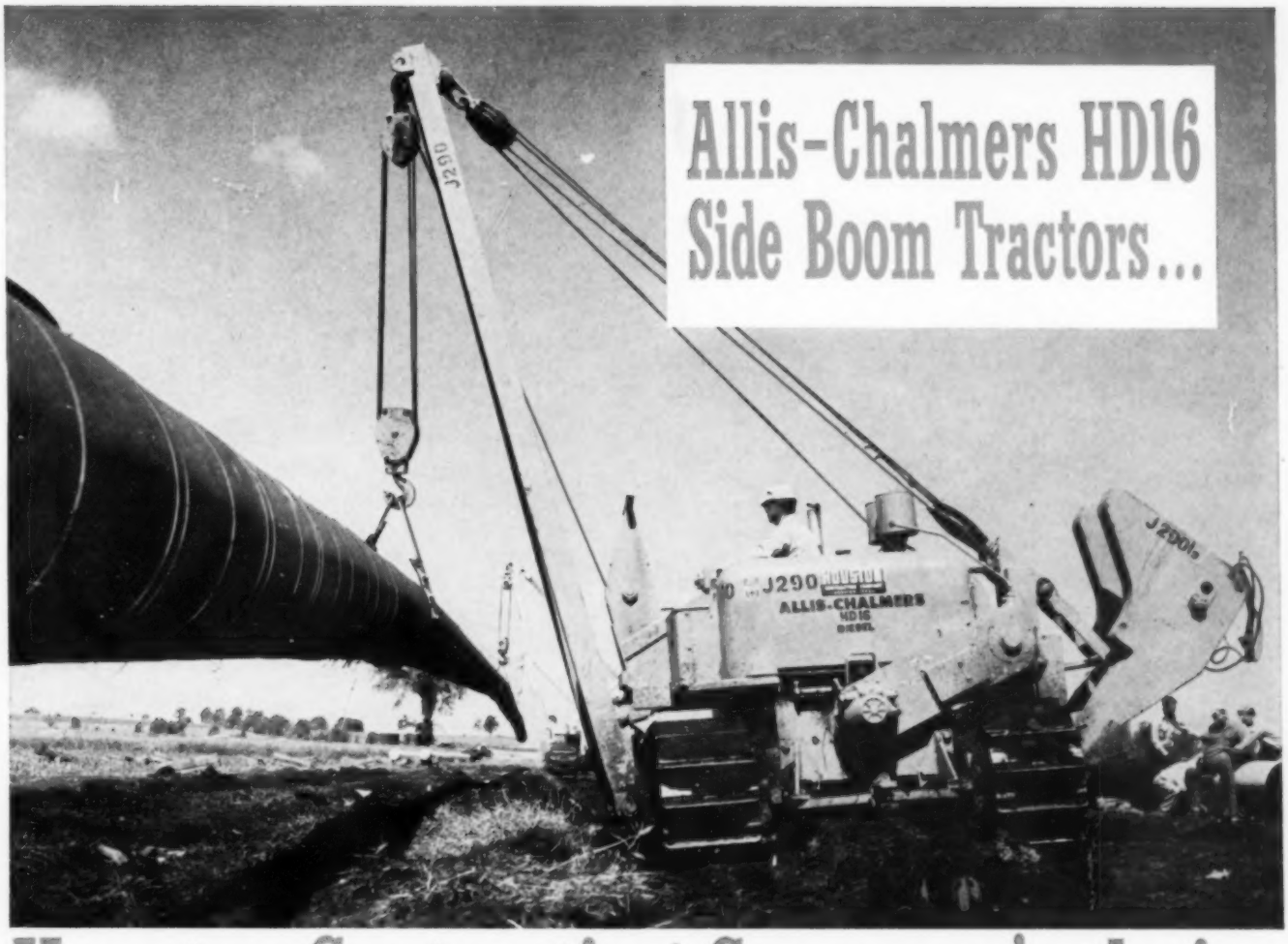


THE GO-DEVIL — READY TO GO!

Partly compressed guide arms and knives are held tight but flexible against pipe walls by pressure of individual springs. Guide arms keep scraper in line, eliminating undue driver wear and prevents cocking. Flexibility permits Go-Devil to round bends.

Go-Devil

G. A. COTTEN CO. **P. O. Box 5332** **Tulsa, Oklahoma**



Houston Contracting Company's choice for 24" Michigan-Wisconsin Pipe Line

There's a good reason for one of the leading pipeline construction company's selecting Allis-Chalmers for their job. First of all, the powerful high-clearance HD-16 is the best balanced tractor on the market which means more efficient operation in hilly and boggy terrain. The famous Allis-Chalmers torque converter is standard equipment in the HD-16 FC Boom Tractor and this means easy operation. And when you're laying pipe in hilly and mountainous terrain the Allis-Chalmers HD-16 has plenty of power—not only to pick up a load but to carry it as well. Still another feature of the HD-16 is the Decelerator foot throttle which frees the operator's hands so he can handle the side boom. The HD-16 costs surprisingly little to operate. Its 150 net hp engine can save you up to 27% in fuel over other tractors of comparable size. Permanently lubricated rollers, heavy duty, extra tough tracks keep maintenance costs low on the HD-16.

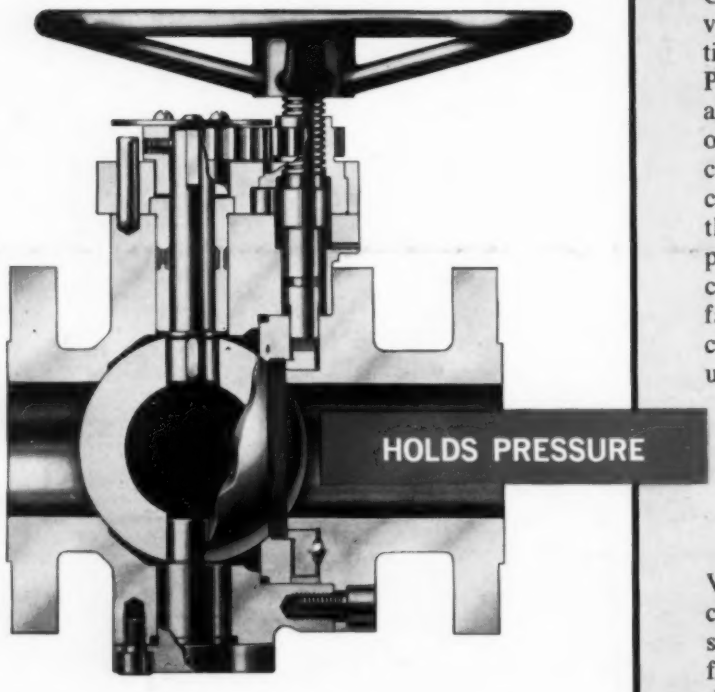
Call Brown-Fogle and ask to have a demonstration of the HD-16 soon.

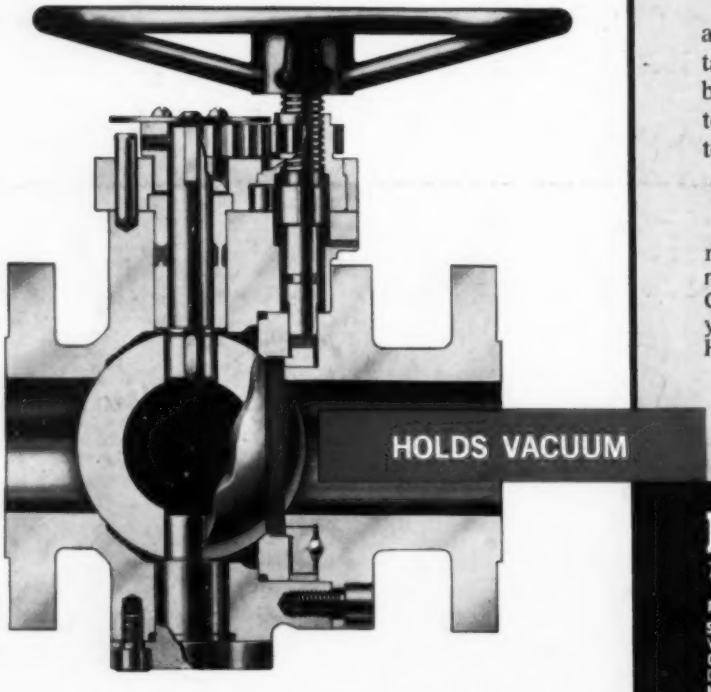
BROWN-FOGLE EQUIPMENT CO.

8821 ALMEDA ROAD • P. O. BOX 14207

JA 9-3555 • HOUSTON 21, TEXAS

Exclusive Controlled Compressible Port Seal provides fast, positive shutoff in any service...





HYDRIL

BALL PLUG Type "K"

VALVES

Controlled sealing . . . a new concept in valve design . . . is the secret of Hydril's tight, bubble-proof shutoff. Hydril Ball-Plug Valves always seal positively against pressure from either direction—or against vacuum—because the fully confined packing ring is mechanically compressed between plug and seat when the valve is closed. This tightly compressed gasket type seal easily bridges clearances between parts as well as surface imperfections. Result: seal efficiency is unimpaired by prolonged hard usage, by rust or sediment.

Design of Hydril Type "K" Ball Plug Valves assures minimum maintenance costs. Non-lubricated, they employ no sealing lubricants. There's no sliding friction between plug and body to produce wear and abrasion.

The spherical plug is mounted on accurately positioned bearings, maintaining a minimal controlled clearance between plug and body. This contributes to easy, free-turning operation as well as to long service life.

●

Hydril valves are available in a wide range of sizes and ratings. Worm-gear and motor-operated models can be supplied. Get the full story on Hydril Valves from your nearby representative . . . or write Hydril Company for free Catalog No. V-60.

HYDRIL COMPANY

714 West Olympic Boulevard, Los Angeles 15, Calif.

Factories at: Los Angeles; Houston, Texas; Rochester, Pa.
Sales Offices: California: Bakersfield, Los Angeles, Ventura • **Louisiana:** Harvey, New Iberia, Shreveport **Oklahoma:** Oklahoma City, Tulsa • **Texas:** Corpus Christi, Dallas, Houston, Midland, Odessa • **Wyoming:** Casper **New York:** New York • **Canada:** Calgary, Edmonton